# The Mining Journal

Railway & Commercial Gazette

## ANNUAL REVIEW—1951 EDITION

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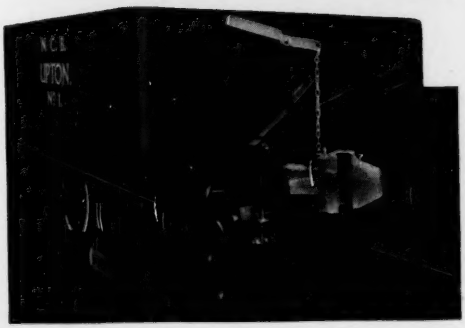
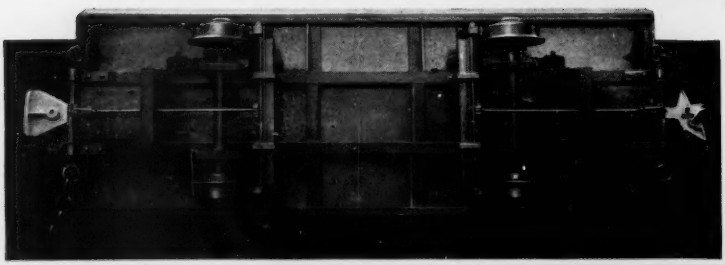
# BUTTERLEY MINE CARS


## ...for the conveying of coal and man-riding

The capacity of the mine cars shown, built for Upton Colliery, is 3 tons of coal or 5 tons of dirt, but the bulk of the cars for the contract have an increased body height to carry a 50-ton pay-load of coal. The body is composed of five generously-radiused 3-16 in. thick pressed-steel sections, butt welded together. The perimeter is capped by 4 in. by 2½ in. by ¼ in. angle continuously welded on top and bottom edges. 3-16 in. gussets beaded with 1 in. O.D. tubing act as stiffeners in the centre of the car.





Views show the frame construction, drawgear and braking arrangements.

FOUNDED 1790

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The Mining Journal
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# ANNUAL REVIEW
# 1951 Edition

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# The Mineral Industry in 1950

THE year 1950 has indeed been an *annus mirabilis* in mining records. Never has there been anything comparable in peace time production or in the development work, which will doubtless help to raise production still higher in the future. With the war in Korea, coming on top of devaluation, we have seen the price of practically every product of the mines, with the exception of gold, advanced last year to record figures, and that, despite the efforts made to keep down prices by artificial ceilings. Everywhere mine wages have been on the rise and their inflation has, to a considerable extent, nullified the gains in price to say nothing of the advance in the cost of new plant and supplies of all kinds. Speaking broadly, there can be no doubt that the position of the miner generally has been strengthened.

The main object of this *Annual Review* is to record the events and statistics of the year for the various metals and minerals, and for the countries in which they are principally worked. While most of our readers, at any rate, must primarily be interested in the months ahead, what has happened in 1950 and is recorded in these pages is important as furnishing that past experience which is an essential basis for assessing the future.

The cause of the enormous stimulus which mining experienced last year, was the unexampled general increase in prices, reflecting a shortage in supply far exceeding anticipations. This shortage, although touched off by the war in Korea, was, of course, partly the result of World War II, during which reserves everywhere were skinned and development perforce neglected.

Stockpiling and world rearmament has made the crisis inevitable. The general advance in metal prices to record figures coupled with the knowledge that continued demand for rearmament promised to postpone any slump indefinitely has stimulated a world-wide movement to open up new deposits and to explore the possibilities of older fields, or of known deposits—uneconomic when prices were far below the present level. In this connection an important influence in the future will be the long-term agreements entered into with the governments of the less developed countries, with in many cases, a guarantee of prices over extended periods.

The general shortage of metals and minerals, and the huge advance in prices has, unfortunately, brought in its train the threat of industrial contraction. So great is the scarcity that industry generally is now being pinched and use-control is becoming general. The world is being taught the lesson that mineral supplies are its greatest need. Mineral deposits are a constantly wasting asset. While food crops can be expanded in a year, and many commodity crops like rubber, coffee and tea in perhaps five years, and even forestry crops in measurable time, mineral deposits are irreplaceable and become more difficult of location, decade by decade. In the absence of any foreseeable increase in labour resources we know of only two influences which can help to alleviate the difficulty; technological improvements, whether in prospecting or operating mines, and improved access to power supply. In these respects much has been accomplished in the past year, especially in the planning and financing stages.

Here we have to note the extension of the tendency noted in last year's *Review* for governments everywhere to take a greatly increased share of the burden and also, in many cases through taxation, of the profit. In Great Britain, at any rate, taxation has made it much harder to attract the risk capital necessary to maintain development on the scale necessary to safeguard the future, and even in the mining areas of the United States complaints are rife that private venture capital is not available on the desired scale. One effect of our fiscal policy in this country, notwithstanding the efforts of the British Overseas Mining Association, has been to drive more and more companies to migrate and establish their registered offices abroad.

Now, as we write, the Government is proposing to take powers under the Finance Act to prohibit this migration, except with special Treasury consent. Such legislation can, it seems to us, only have the effect of finally discouraging any new overseas mining companies from ever again seeking what were once the great benefits of British incorporation, and as existing mines gradually disappear the decline of London as the world centre of mining fiance would become inevitable. Let us hope, however, that wiser counsels may yet prevail.

In Great Britain, Government intervention has also made itself felt in a further bout of nationalization—this time of iron and steel. Coming at a time when the industry was already in a high state of efficiency, it is a little difficult to see what advantage the Government can hope to gain from this further encroachment on private enterprise. Meanwhile, the National Coal Board is failing to keep pace with the growing demands made upon it, both at home and abroad; costs and selling prices continue to rise and in the past few months the Board has once again barely been paying its way.

The past year has also witnessed governmental action at the international level in a number of directions. An entirely new form of international control has been established under the Schuman Plan to co-ordinate the coal, and iron and steel resources of Western Europe. If this form of supra-national authority can be proved to work, we could be on the threshold of a new economic era, but the experiment has yet to be tried.

All over the world prospecting and mining has been stimulated by the injection of E.C.A. funds, which of itself is making a major contribution to the expansion in mineral production.

The creation of satisfactory international machinery for allocating commodities in scarce supply is still in the evolutionary stage. Certainly it must be admitted that the problem is far more complicated to-day than it was during World War II, when virtually the problem was only one of equating the requirements of two countries—the U.S.A. and the U.K.—and of denying supplies to enemy and quasi-enemy countries. Be that as it may, there is now

no question but that the distribution of the world's metals and minerals is rapidly ceasing to be a commercial operation and is becoming overshadowed by considerations of international politics and strategy.

Although the centre of the metals crisis is continually shifting, at the moment it is the availability of the group of alloy metals which is the focus of attention and on which adequate supplies of steel products are dependent, even more than they are on the availability of iron ore and coal, which problems in themselves are troublesome enough.

Indeed in no branch of the mining industry has the shortage of supply been more general than in the supply of coal. Everywhere supplies are short and in many countries restricted to an extent never before experienced. This has led to an enormous development in projects for generating hydro-electric power, especially in North America but also in South and West Africa, India, Australia and elsewhere. Many of these are directly coupled with enormous expansion plans for aluminium production which now appears a metal with almost unlimited output possibilities provided an abundance of cheap electrical supply can be secured. The chief consideration in providing electricity for industry on an economic basis is capital cost. The sooner generating plant can be installed, the sooner power, hitherto running to waste, can be harnessed for industry. Manufacturers of generating plant and of all its ancillaries, especially transmission cables, are confronted with projects which will ensure the largest possible output for many years to come. The shortage of coal is also operating to the advantage of the oil industry and to the equipment of the huge and complicated distilling and refining plants as well as of the tanker fleets which supply the crude oil to countries where refinery operations are carried on at a distance from production fields.

But aluminium is not the only "new" metal which is being called in to assist the deficiencies in the supply of the more familiar industrial metals. There are great possibilities of turning titanium ores into new industrial channels. Magnesium, too, figures largely in the North American scheme for additional supply of the light metals in connection with aviation; while nickel is expected to play an increasing part in the provision of essential metals, as evidenced by the extensive expansion schemes in older fields and the operation of others hitherto unworked.

To sum up, the outstanding feature for the year has been the demonstration that the mineral industry is the lynch-pin on which world economy hinges, whether in peace or war, and its priority over all other departments of human productivity must be realized if the present level of civilized existence is not to be lowered. Moreover, as ever, new sources of exploitable mineral must be continuously revealed and opened up, production must be planned for years ahead and computations made of future economic requirements, lest great hopes of material progress and world betterment should fail for lack of metal and mineral. Wonderful as its past achievement has been, the mineral industry has an ever bigger and more vital part to play in the future.

# Gold

By E. BALIOL SCOTT

THE world's gold mines yielded an increased output last year. It is impossible as yet to give any reliable total, especially as Russian production still remains entirely secret. The Union Corporation, in their annual computation suggests a figure of 26,000,000 f.oz., or 500,000 f.oz., increase on their 1949 figure. But for many years this authority has credited Russia with a conventional figure of 2,000,000 f.oz. a year, and higher estimates are generally adopted in America. Stimulating influences were 12 months of devalued currencies in all countries other than United States, the increase in by-product gold resulting from larger production of the base metals, various expedients to assist small and high cost producers and the more ready availability of new equipment and supplies. The growing inflation of the world economy resulting in higher costs especially for labour, tended to offset the factors of stimulation and the increase in output was less than had been hoped for at the beginning of the year. All the more important producers maintained their relative position to one another.

South Africa shows a small decline on the 1949 figures despite enjoying the full measure of currency depreciation and a considerable licence in the sales of premium gold in "manufactured form." The chief reason was probably the reduction in the grade of ore worked which the higher selling price permitted. But the necessity of building up developed ore reserves may also have played some part, and, further, the great future potentiality of the Orange Free State and the consequent urge to get properties to the production stage must have been felt.

In Canada, the subsidies to high-cost producers under the Emergency Gold Mining Assistance Act, together with the increased activity in the base metal mines yielding by-product metal were factors as important as the ten per cent devaluation in exchange.

In Australia, the dominance of the unions and increasing costs of transport and supplies resulted in a further small decline, while in the countries with lower output the gains and losses have been fairly equal. The table of f.oz. produced gives the detailed figures so far as they are available at present, but in many cases estimates of somewhat uncertain character are all that are available. Producers with an output of less than 80,000 oz. per year are omitted.

**GOLD OUTPUT FROM PRINCIPAL PRODUCING COUNTRIES**
Excluding U.S.S.R.
(in fine ounces)

| | 1949 | 1950 | + or — |
|---|---|---|---|
| S. Africa | 11,705,048 | 11,659,280 | — 45,768 |
| Canada | 4,123,518 | 4,430,612 | + 307,094 |
| U.S.A. | 1,949,000 | 2,391,683 | + 442,683 |
| Australia | 893,339 | 860,000† | — 33,339 |
| Gold Coast | 671,984 | 663,000 | — 8,984 |
| S. Rhodesia | 528,150 | 511,163 | — 16,987 |
| Mexico | 405,540 | 400,000* | — 5,540 |
| Colombia | 359,475 | 379,412 | + 19,937 |
| Congo | 333,847 | 350,000* | + 16,153 |
| Philippines | 289,303 | 300,000* | + 10,697 |
| Nicaragua | 218,831 | 220,000* | + 1,169 |
| Chile | 179,140 | 200,000* | + 20,860 |
| India | 160,991 | 189,493 | + 28,502 |
| Brazil | 119,179 | 130,000* | + 10,821 |
| Japan | 118,995 | 120,000* | + 1,005 |
| Peru | 112,308 | 110,000* | — 2,308 |
| Fiji | 104,136 | 100,000* | — 4,136 |
| New Guinea | 93,045 | 100,000* | + 6,955 |
| N. Zealand | 84,874 | 80,000* | — 4,874 |

*Provisional †Dec. est.

## The Price of Gold

We are still as far as ever from the conversion of the world currencies to a gold basis and the validity of the so-called world price of $35 per f.oz. seems less secure at any rate on a long view. There seems to be a growing realization in the United States as well as an increasing belief abroad that the currency dollar is being slowly divorced from the real value of gold, and this, not merely among the mining interest, who see the paper value of all commodities and services markedly on the up-grade while producers in countries where the I.M.F. influence is ignored or weakened receive enhanced values.

Many important authorities in the U.S. and elsewhere have voiced opinions that the dollar value per f.oz. should be increased to $50 and often much higher. But the United States Treasury still holds the bulk of the world's supply and the enormous efforts of the United States to expand its armed forces, its industrial capacity and its aid to backward or undeveloped countries seems to make it imperative to avoid currency devaluation with so many inflationary influences already at work. However, the U.S. gold stocks are showing a very sensible diminution from their maximum figure in September, 1949, of $24,690,000,000, and by the end of March of the current year the total was $21,806,000,000 a decline of $2,884,000,000, or, say 80,000,000 f.oz. The great increase in U.S. imports, for which foreign nations for the most part desired gold rather than dollars in payment, seems likely to continue, and, theoretically at least, the stage should eventually come when the country begins to take alarm at deficit budgets. However, this is apparently far from the position as yet, and in the unfortunate event of the cold war taking on a more active character, the issue might be indefinitely postponed.

## Position of I.M.F.

Meanwhile the International Monetary Fund seems to be fighting a losing battle with successive face-saving concessions which tend to diminish its authority. Premium gold sales from South Africa of "manufactured" gold articles are said to have represented some 30-40 per cent of the output in the last quarter of the year. These are usually in a form easily reconvertible into gold bars such as gold sticks, finger-bowls, salt cellars, busts, etc., and whenever the so-called "free market" price rises, the tendency is for this type of premium gold to increase.

Apart from the "premium" gold price issue there is the existence of "free" gold markets which appear to have become systematized during the year, especially in Zurich and Tangier. Those who organize and operate these centres naturally do not parade their activities but there is a large amount of rumour surrounding them which cannot be altogether ignored. It has been reported that some £1,500,000 of gold bars with a Moscow mint imprint were sold in the Zurich market towards the end of the year, which suggests that the Russian authorities have found it convenient to dispose of some of their gold accumulation, possibly to acquire dollars for commodity purchases, or for use in the Middle and Far East. In Tangier it has been reported by the *Chicago Tribune* that the Banque Tangero-Swisse, in association with the Banque pour Valeures de Placement, of Zurich, is issuing gold certificates against deposits of fine gold in the Tangier Bank, and these are either inscribed or bearer. To what extent these operations may have played any part in organizing a "free" gold market we do not know, but they point to a growing resistance to the policy of the I.M.F. and quite recently the Bank of France is said to have also been selling on the "free market."

Over the coming year the miner, at any rate, need not fear any reduction in price, and increased costs seem the only adverse factor. For the time being large capital investments in new mines should make for increasing output, though this may not be a big influence during 1951. On purely economic grounds we cannot expect that gold will remain the sole exception to the huge increase in the price of all commodities.

# Silver

DURING 1950 a basic change gradually developed in the world situation of silver. From the end of the war up to the earlier months of the year under review the general situation had been one of over supply, but after the international situation began to darken with the troubles in Korea, the prospect of long-term defence programmes exercised a growing effect on the demand for silver, especially in the role of a substitute for metals in increasing scarcity. This change was illustrated by the rise in prices from the new year opening of 73½c. to 80¼c. per f.oz. at the end of the year, a rise which culminated last January at 90½c., the price which under the Silver Purchase Act the U.S. Treasury must pay for domestically mined silver. So long as this latest price is maintained, U.S. consumers can fill their requirements from the stocks held by the Treasury which have been steadily growing since there was no incentive to purchase domestic silver as long as imported metal was cheaper. These stocks at the end of the year were estimated by Messrs. Handy and Harman at 2,861,200,000 oz., an increase in the year of 40,400,000 oz. but of course this figure includes coinage in circulation. In Great Britain the advance in prices was from 64d. to 70d. with a corresponding increase in January to 78½d.

The course of events during the year confirmed the transference of the world's silver market to the United States—the only world market where business on a big scale can be transacted.

The close control exercised by the Bank of England on the London market was maintained, and prices generally merely reflected the changes in New York. The Indian market remained isolated with the continued ban on imports of silver and the Reserve Bank of India has not supplied the market there with any metal since the end of 1949.

**SILVER PRODUCTION AND PRICE**

Excluding U.S.S.R. and satellites
(in millions of f.oz.)

| PRODUCTION | 1948 | 1949 | 1950 |
|---|---|---|---|
| Mexico | 45.8 | 49.5 | 47.0 |
| United States | 36.1 | 34.0* | 42.4* |
| Canada | 16.1 | 17.6§ | 22.4§ |
| Peru | 9.3 | 10.6 | 10.5 |
| Australia | 9.3 | 9.0 | 10.0 |
| Bolivia | 7.6 | 7.0 | 5.7 |
| Belgian Congo | 4.0 | 4.0 | 5.0 |
| Other countries (estimated) | 16.0 | 16.7 | 15.5 |
| TOTAL | 144.2 | 148.4 | 158.5 |
| AVERAGE PRICE | | | |
| New York c. per oz. | 74.36 | 71.93 | 74.17 |
| London d. per oz. | 45.00 | 49.24 | 64.80 |

*U.S. Bureau of Mines
§Canadian Government Bureau of Statistics
Source of all other figures: Handy & Harmon

**Production**

As will be seen from the accompanying table world production increased during the year, chiefly in the United States but to a minor extent in Canada. Mexican production was lower as was that of Bolivia. Peru showed little change while the minor Spanish American states showed some increase. Messrs. Handy and Harman estimate world production of new silver at a total of 157,200,000 f.oz., as against 149,600,000 f.oz. in 1949.

The U.S. mine output was reported by the Bureau of Mines as 42,419,129 f.oz. compared with 34,090,000 f.oz. in the previous year. The increase was mainly in by-product silver, which reflected the high level of activity in the base metal mines.

Mexican production is estimated in round figures as 47,000,000 oz., a decline of 2,500,000 from the figures of the previous year.

Canadian production improved by 4,774,657 oz. at 22,416,150 oz. as compared with 17,641,493 oz. in 1949, according to the preliminary estimates of the Government Bureau of Statistics.

The output of Peru is computed as 10,500,000 oz. (10,600,000 in 1949); of Bolivia at 5,700,000 (7,000,000) oz., and other Spanish American countries at 8,000,000 oz. (6,700,000 in 1949).

Imports of silver into the United States showed, as might be expected, a big advance, and amounted, according to Messrs. Handy and Harman's figures, to 139,300,000 oz. compared with 103,200,000 oz. in the previous year, of which 37,300,000 oz. are attributed to de-monetized coinage. Exports were small at 4,900,000 oz., this low figure being due to absence of coinage orders, and there were available for industrial consumption in the United States 125,800,000 oz. from foreign sources.

During the first eleven months of the year, the U.K. imported 15,171,450 oz. and exported 20,341,150 oz. The excess exports appear to have been due in part to the continued de-monetization of the old silver coinage resulting in some 22,000,000 oz. of recovered silver. This source of supply will not be finally worked out for some three years or so, though the amount will be a steadily decreasing one. As already remarked, India was isolated from world trade and, with a net consumption of some 12,000,000 oz. (30,000,000 in 1949), this demand was met from de-monetized coin, smuggling and hoards.

**Consumption**

Consumption in the arts and industries in the United States showed great expansion, and computed as 120,000,000 oz. (90,000,000 in 1949) was the highest rate since the war. Silverware was the largest consumer, but there is growing consumption for brazing wire and in high-cost alloys, and possibly a substitution use in the production of tinless solders.

In contrast to the United States' increased consumption, that of Great Britain was rather lower, being computed at around 11,000,000 oz., compared with 11,500,000 oz. in the previous year, and 14,000,000 in 1948. Canadian consumption is put at 5,200,000 oz., Western Germany at 9,600,000 oz., and Mexico 2,500,000 oz., with minor unascertainable quantities for other countries. In all, Messrs. Handy and Harman put world consumption at around 150,000,000 oz. without considering coinage requirements (which last year were small), as against a total world production estimated at 157,000,000. It is obvious, therefore, that there is little or no margin so far as new silver is concerned, but there are possible stocks which might be released if prices were sufficiently attractive. However, now that U.S. Treasury stocks can be disposed of at a world price, no shortage of metal need be apprehended, so long as the Treasury level is not again raised or deliveries rationed.

Though the New York market determined the course of prices, Mexico appears to have been the prime mover. The Bank of Mexico alternately withheld supplies and sold freely with a view to maintaining steady and gradually advancing prices, but with the lid removed from the US. Treasury's accumulation, the current quotation of 90½c. should not be exceeded unless any stockpiling policy should be decided on in Washington. Incidentally, nothing more has been done to repay obligations on Lease-Lend silver, principally from India,which still total 410,553,011 oz., and it is more than ever difficult to see how this can be repaid.

# Platinum Metals

THE Platinum Metals, never an easy group to review owing to paucity of data normally available, is especially so this year when there is so much taking place outside the sphere of commercial transactions and veiled in official or semi-official secrecy. Probably stockpiling in the United States and elsewhere was the most potent factor in raising forces and bringing about a general scarcity and restrictions on use. Of stockpiling, little or nothing is known.

From a production point of view the feature was the great rise in the Transvaal output, the effect of which in the way of sales of refined metals has still to be fully experienced. South Africa in 1950 ran Canada very close so far as crude production is concerned. The total output is reported as 256,385 oz. compared with 120,000 oz. in 1949, though sales increased only from 94,092 to 105,750 oz. In the course of the current year the big enlargement of the Brimsdown Works should be turning out refined metals in step with the much increased mine output.

The Canadian output as reported by the official Statistical Bureau was considerably below that of 1949: the total being 269,442 oz., of which platinum accounted for 121,100 oz. and palladium and the rest for 148,342 oz. The corresponding figures for 1949 were 153,784 and 182,233 oz. respectively or a total of 366,017 oz. On the other hand, sales considerably exceeded those in 1949. Disposals by the International Nickel Co. were given as 267,316 oz. compared with 214,735 oz. in 1949. What the Falconbridge Nickel sales were we do not yet know.

No official figures of Colombian output have been given for the past two years: officially reported exports in 1949 were 19,739 oz. compared with the steady average output of some 40,000 oz. previously, so there may have been unreported exports. In 1950 the usual output level may have been maintained as U.S. imports of the platinum metals in grains and nuggets, almost wholly of Colombian origin, were according to the U.S. Department of Commerce, 26,532 oz. in the first nine months of 1950. The Alaskan output from the Goodnews Bay district is officially reported as greater than in 1949; the total may have been around 15,000 oz.

Platinum production in Sierra Leone, which in recent years had fallen to a few hundred oz., appears to have ceased entirely in 1950. Nothing is known regarding the situation in Abyssinia; with the greatly increased price, however, some small production seems probable.

No news is available regarding mining for the platinum metals in the U.S.S.R., but there was a resumption of exports of palladium after a considerable interval and 44,427 oz. were received in the United States.

There were large shipments of platinum from Britain to the United States, said to have amounted to 58,188 oz. in the first nine months, of which 34,000 oz. were for Government stockpile.

Prices rose markedly especially in the second half of the year—platinum being quoted at $69 and £24 per oz. at the beginning of the year and $103 and £27/£33 5s. at the end. This was accompanied by speculative operations in the U.S., but was due fundamentally to exceptional consumer demand, especially in the third quarter which established a U.S. record at 107,600 oz.

The palladium price was unchanged on the year at $24 in the U.S. and £7 10s. in London, as was rhodium at $125 and £45. Iridium rose from $100 to $220 an oz., osmium from $100 to $200, while ruthenium kept pace with platinum.

# Copper

By E. BALIOL SCOTT

THE year 1950 imported many new features into the copper industry, and while the mines benefited by the exceptional prices, consumers and suppliers found it somewhat of a nightmare. World production of primary copper increased substantially over the recession figures of 1949, and is computed by the United States Bureau of Mines at from between 2,650,000 and 2,700,000 s.tons. The Copper Institute figures compiled from the records of its members totalled 2,336,183 s.tons compared with 2,188,808 s.tons in 1949.

Things proceeded fairly smoothly in the first half of the year, but with the beginning of the war in Korea, price advances, stockpiling by government and private interests, "official" price ceilings, the prospects of restriction in civilian uses, and fear of a roll back in prices in the U.S. together created a situation in which purchase prices became of less and less consequence to buyers. While the "official" price in the United States rose from 18½c. to 24½c. per lb., during the year, in the "grey" market much higher prices were paid for the moderate tonnages available, and as high as 45c. per lb. has been reported with European buyers willingly paying 35c. In the United Kingdom prices mainly conformed to the New York level opening at £153 per ton for electro and closing at £202. Generally speaking, the export price for copper in the U.S. was approximately 0.225c. above the "official" quotation, but after September the premium was 1.399c. By the end of the year the conundrum was posed of how to decide in which country or area civilian consumption was to suffer, but although an International Combined Material Resources Board was created early in the current year to study the picture, the question is still unanswered.

**PRIMARY COPPER PRODUCTION (Smelter Basis)**

Excluding U.S.S.R. and Yugoslavia
(in thousands of s.tons)

| | 1948 | 1949 | 1950 |
|---|---|---|---|
| United States* ..... | 1,107 | 928 | 1,256 |
| Chile..... | 470 | 387 | 375e |
| Northern Rhodesia... | 235 | 290 | 309e |
| Canada..... | 213 | 224 | 240 |
| Western Germany†... | 44 | 114 | 145e |
| Belgian Congo† ..... | 171 | 155 | 160e |
| Mexico ..... | 57 | 60 | 62e |
| Japan ..... | 32 | 39 | 43e |
| South Africa ..... | 32 | 35 | 38 |
| Finland ..... | 20 | 23 | 19e |
| Peru ..... | 14 | 23 | 23 |
| All other countries (under 20,000 tons) | 64e | 64e | 64e |
| TOTAL ..... | 2,459 | 2,342 | 2,734 |

*U.S. Bureau of Mines figures of refined copper from domestic and foreign ores.

†Statistical Office of U.N.O. Includes secondary copper.

Source of all other figures is the American Bureau of Metal Statistics except that where only the partial figures for 1950 are available, an estimate (e) has been made.

## U.S.A. Production

The U.S. mine output was 907,000 s.tons compared with 761,904 s.tons in the previous year. Refinery production of new copper from domestic sources was 927,000 s.tons against 695,015 s.tons in the previous year. Imports of foreign ores increased from 232,912 s.tons to 329,000 s.tons, giving a total refinery output of new copper of 1,256,000 s.tons against 927,927 in the previous year. Production of copper from plants treating only secondary material was less at 186,000 s.tons against 212,392 s.tons. Total production of secondary copper is reported as 942,000 s.tons, compared with 713,143 s.tons, new and old scrap contributing about equally to the total. U.S. imports of refined copper during the year were, in round figures 315,000 s.tons producing a total of new refined of 1,571,000 s.tons. With stocks at the end of the year 61,000 s.tons, there was a total supply of 1,632,000 s.tons available. Deducting 138,000 s.tons for exports and a reduction in refined stocks from 61,000 to 19,000 in the course of the year, there remained total withdrawals on domestic account of 1,475,000 s.tons. Included in the domestic withdrawals were additions to the national stockpile computed as 260,000 s.tons. This indicates total withdrawals by domestic consumers of 1,215,000 s.tons. Doubtless there was considerable inventory accumulation by many industrial consumers. Two new plants came into commission, the Phelps-Dodge Smelter at Ajo, Arizona, and the Kennecott Copper Refinery, at Garfield, Utah. Development of the San Manuel property in Arizona and of the Great Butte project in Montana, were pushed on but production will not be available for a considerable time to come.

## Production Elsewhere

While the Chile output fell off somewhat, that state was still the second largest copper producer in the world. U.S. imports of refined, blister, regulus and concentrates totalled 258,210 s.tons and the production total is estimated at around 375,000 tons, or about 100,000 tons below the 1949 figure. This falling off in production has adversely affected the Government revenue and strong representations were made towards the end of the year by the Chilean President and other officials for a premium price being made available. The position was made more difficult by the reimposition of the 2c. Copper Duty in the second half of the year, which U.S. consumers were called upon to pay. The reduction in output was contributed to by several strikes.

Third in magnitude of production was Northern Rhodesia with a gain of 19,000 tons at 311,000 tons. The output would have been larger but for shortage of coal supply and some temporary small strikes. Rhodesia exported some 75,000 tons of blister to the United States; besides 105,871 tons to the U.K., in addition to 44,387 tons of electro, making a U.K. total of 150,258 tons.

Canadian mine production was 261,914 s.tons compared with 263,457 s.tons in 1949.

The German production seems to have increased considerably being computed somewhat in excess of 200,000 tons, but this is presumably chiefly metal treated on toll and proceeds of scrap refining.

The output of the Belgian Congo reported as around 160,000 tons in 1949 may have increased, but is unlikely to have done so to any considerable extent.

Mexican imports into the United States during the year were 58,085 s.tons. Total Mexican mine production has been reported as 61,704 tonnes.

Production in Japan seems to have increased, exports to the United States being reported by the U.S. Bureau of Mines at 53,509 s.tons, about half fro n scrap. Production in South Africa increased from 34,519 s.tons to 37,598 s.tons.

Peru exported to the U.S. 26,819 s.tons of copper in all forms of which 14,427 s.tons were refined copper.

Finland credited with a mine output of 26,811 s.tons in 1949 probably increased its output but definite figures are wanting.

The U.K. imported 317,904 tons, according to the Board of Trade returns, and consumed 333,700 tons of new copper besides 188,298 tons of copper recovered from scrap, making a total consumption for the year of 521,998 tons compared with 496,720 tons in 1949. Stocks declined from 129,700 tons at the beginning of the year to 104,330 tons at the end.

# Tin

By E. BALIOL SCOTT

NINETEEN-FIFTY was an epochal year for tin. Starting at around £600 per ton in January, by mid-August it considerably exceeded £800 and after fluctuations, £1,300 was reached in November, easing slightly to £1,290 at the end of the year. These were cash prices and three months was sometimes £100 lower. The advance continued into the current year when cash was quoted £1,615 per ton on on Wednesday, February 14, equivalent to 14.4s. per lb., or 1s. 2d. per oz., verging on the price of a precious metal. Daily fluctuations in excess of £100 were not uncommon by the end of the year. Gradually as the Ministry of Supply disposed of its stocks in the United States buying tended to centre in the East rather than in London, and Straits prices are tending to become the world's standard.

The year opened with much anxiety as to how far growing stocks in the United States and elsewhere coupled with the certainty of increased output would result in prices being pushed down. All apprehensions on this score, however, disappeared as stockpile buying developed in the only world free markets—London and subsequently Singapore—and was succeeded by a world shortage of free tin due to purchases in excess of normal requirement. For this the policy of the United States Administration was chiefly responsible but consumers everywhere, and to some extent no doubt governments, followed suit as a measure of precaution. At the time of writing the United States Government has taken complete control of American purchases and allocations for consumption, and tin is under as complete control as at any time during the world war.

**PRIMARY TIN PRODUCTION AND CONSUMPTION**
Excluding U.S.S.R.
(in thousands of tons)

| PRODUCTION OF TIN IN ORE | 1948 | 1949 | 1950 |
|---|---|---|---|
| Malaya | 44.8 | 54.9 | 57.5 |
| Indonesia | 30.6 | 29.0 | 32.1 |
| Bolivia | 37.3 | 34.1 | 31.2 |
| Belgian Congo | 12.9 | 13.8 | 14.6 |
| Nigeria | 9.2 | 8.8 | 8.3 |
| Siam | 4.2 | 7.8 | 10.2e |
| Other countries | 12.5 | 13.5 | 13.6e |
| Total | 151.5 | 161.9 | 167.5 |
| STOCKS AT YEAR-END | | | |
| U.S.A. (excluding stockpile) | 63.5 | 59.8 | 66.7* |
| U.K. | 20.9 | 23.1 | 12.8* |
| All other countries | 49.6 | 46.4 | 37.4* |
| Total | 134.0 | 129.3 | 116.9* |
| U.S. stockpile | 69.0e | 88.0e | 130.e* |
| CONSUMPTION | | | |
| U.S.A. | 59.9 | 50.1 | 76.0e |
| U.K. | 25.2 | 20.8 | 22.8 |
| India | 4.8 | 5.5 | 4.7 |
| France | 9.7 | 8.4e | 8.4e |
| Canada | 4.0 | 4.4 | 4.6e |
| Western Germany | 1.8 | 3.9 | 5.4e |
| Other countries | 30.3 | 25.8 | 29.5e |
| Total | 135.7 | 118.9 | 151.4 |

e estimated *as at November 30, 1950
Source: International Tin Study Group

**Production**

As is shown by the table on this page, output by the main producers, from which countries alone exports are made, increased except in the case of Bolivia and Nigeria, though the increase was less than had been expected; while the minor producers, whose outputs for the most part do not suffice for their own needs, about maintained their former levels. Altogether the International Tin Study Group estimates world production in 1950 at 167,500 tons or 5,600 tons above 1949.

Our Malayan correspondent, in his review deals with the salient features of the year's record there.

**Consumption**

It is impossible to estimate with any accuracy what the actual consumption of tin was last year. Apart from government stockpiling, which is never officially disclosed, United States consumers sought, by increasing their inventories, to insure themselves against the day when complete governmental control would be established, though the enormous advances in prices made this a very speculative policy. Consumers elsewhere had not the same financial resources with which to operate. U.S. consumption has been variously computed. That of the U.K. is put at 22,800 tons. There can be little doubt that in many countries tin consumption was restricted by the inability to obtain supplies.

**Substitutes**

Probably the most important development of the year is to be sought in the far reaching movement in the United States to economize on the use of the metal, either by substitution or, as in the case of the tinplate industry, by evolving new techniques enabling less tin to be used for a given output of finished material. Hitherto, such changes in practice were difficult without slowing down the speed of production, but it has recently been claimed by the American Can Co., that this obstacle has been overcome in their latest research programme, and that substantial economies in consumption are being achieved. However, economies due to the enormous advances in the price of the metal are not the only reason for the great capital outlay on new plant. Fear of renewed starvation of the industrial consumer through stockpiling has also been an influence.

The United States tinplate output last year is computed as 4,243,005 tons as compared with 2,296,670 tons in 1949, and the total world output at 5,699,000 tons against 4,495,000 tons in the previous year. There can be little doubt that the demand for packaging especially of foodstuffs, will continue to grow. There is a further anxiety in the United States regarding a possible interference with supplies should the tide of Communism spread in East Asia threatening Malaya and Indonesia. Unlike other metals, the United States cannot hope to increase its supplies of tin in the Western Hemisphere where Bolivia is the only producer of any importance, and where production has been tending to dwindle for a considerable time.

**The Prospect**

After the hectic experiences of the past year what are the prospects for tin? If the U.S. Government maintains its abstention from market purchases for any length of time we can only look for lower prices. After the end of the first world war their abstention in 1920 was attended by the fall from £419 a ton to as low as £139. To-day, however any decline of comparable proportions would, owing to the great increase in costs, result in widespread closing down by producers. Moreover, the economic dislocations and consequent unemployment would entail the most serious repercussions on the policy of building up social security in the Far East and in Bolivia, not to mention Central and West Africa. At the time of writing it is quite impossible to form any opinion as to the outcome of the Materials Conference proceeding in Washington. Moreover, the long-term inability of the mining industry to open any new tin mines is always tending to contraction of output, and may result, even in the current year, in little or no increase on the total of tin won over 1950. The United States is showing that tin is not so indispensable to industry as used to be assumed, and it may be that we are now approaching a period of economic readjustment both as regards production and consumption compared with the extremely artificial position which obtained last year.

# The London Metal Exchange

ON January 1, 1950, the London Metal Exchange had been open for dealings in tin only since the middle of November of the previous year, and Members were still educating staff and polishing up their own skill in the technique of the Market. The difficulties were increased by the British Ministry of Supply's reluctance to release sufficient tonnages of tin in excess of current demand, to enable the Members of the Exchange to build up the basic stock which is always necessary for the orderly control and development of price fluctuations. In spite of these handicaps, the market can be said to have functioned efficiently, both during the first half of the year when the cash price remained around £600 a ton, and later when the price rose rapidly owing to international developments following the outbreak of hostilities in Korea. After the Korean war started, the price of tin rose steadily, passing in mid-July the level at which the market originally opened, and ending the year at £1,150 per ton cash and £1,095 forward which were only slightly below the year's peaks.

At the beginning of the year it was estimated that the U.K. Government held stocks of tin in the U.K. and Malaya amounting in total to some 31,000 tons, and sales from this tonnage continued both through the London Metal Exchange and by direct shipments of Straits tin to New York until August 10, when the U.K. Government decided to stockpile the unsold balance of its stocks amounting to some 7,000 tons, all either in, or afloat to, the U.K. This figure was subsequently reduced by about 1,000 tons owing to the Government's action in helping the market over the extremely difficult period between August 10 and November 10.

One of the main features of the year was the very heavy demand from America both for stockpiling and consumption, and it was largely this factor which enabled the U.K. Government to dispose of its stocks without unduly depressing the price, but it also rendered the workings of the London Metal Exchange more difficult as the market was unable to build up stocks.

The year was also a time of much jockeying for positions by producer and consumer countries, and whereas at the beginning of the year an over-production of tin was confidently forecast and the talks were mostly about minimum prices and restriction of output, by the end of the year the talks were about a maximum price and increasing output. This change was due entirely to the American attitude towards stockpiling which, in the first part of the year, was at a rate sufficient to absorb the surplus production, but which, after Korea, increased to such a pitch that, in conjunction with purchases by European countries, the price was forced up to almost £1,300 per ton in Singapore early in November.

The year 1951 has seen continued efforts on the part of the U.S. to stop any further increase in price and bring tin under the hand of the bureaucrats once more. In America itself the Government made themselves, through their appointed agent the R.F.C., the sole importer and supplier of tin, and have introduced many regulations, all with the aim of reducing consumption; but in the U.K. the London market has remained open and it is believed that the Government here are not willing to re-enter the tin business in the same way as before, and it is hoped that the behaviour of the market during 1950, and the very close liaison which has been built up between it and representatives of the Ministry of Supply and the Bank of England, will result in its continuing to function during 1951 with increasing efficiency and advantage to the tin industry throughout the world.

# Lead

By E. BALIOL SCOTT

THE record of lead in 1950 produced two marked contrasts coinciding roughly with the first and second half of the year. Speaking very broadly demand and supply were in balance until the effects of the Korean imbroglio began to make themselves felt at the end of June. This is indicated by the course of prices which, after declining in the first quarter, remained pretty steady to the end of June, after which they advanced fairly steadily up to the end of October, when a virtual ceiling was fixed on the United States quotation—the nearest approach to a world price. By the end of the year consumers were beginning to have difficulty in obtaining sufficient lead to meet their requirements. This marked reversal in the trend of prices and supply is not surprising, as lead is probably the least expandable industrial metal to-day. Russia apart, there are only four major producing countries, United States, Mexico, Australia and Canada, in that order, and no important new field has put in an appearance since Mount Isa, shortly after the end of the first world war.

**Production and Use**

Statistics of mine output are not so readily forthcoming as in the case of metals like gold, copper, tin and aluminium, and full figures are available only for the United States and Canada.

The United States total mine production, according to the U.S. Bureau of Mines, improved by just on 20,000 s.tons to 429,875 s.tons, the highest figure since 1943. In addition imports of lead were the highest on record and amounted to 520,586 s.tons—441,741 tons in pigs and bars, 75,288 tons in ore and matte, and 3,557 tons in base bullion. Refinery production is put at 532,242 s.tons of refined and 61,912 s.tons antimonial lead—an increase of 6 per cent in refined and a decrease of 50 per cent in antimonial lead. Recovery of lead from scrap at primary and other plants declined by some 17,000 s.tons to 395,000 s.tons. Thus there was available in round figures 1,429,000 s.tons. Consumption of lead in all forms is estimated at 1,220,000 s.tons, leaving some 200,000 s.tons to be accounted for. The United States Government took for stockpile during the first six months of the year amounts estimated to total some 100,000 s.tons, leaving 100,000 s.tons to be accounted for, which may well have represented inventory stocking by industry, and we know the feverish efforts which were made by consumers to increase their inventories towards the end of the year. The estimate for consumption was 27 per cent over that for 1949 and was the highest on record, as were the imports, of which Mexico supplied 60 per cent, Canada 24 per cent, Yugoslavia 10 per cent, Peru 7 per cent, Australia 5 per cent.

In Great Britain stringency became marked earlier than in the United States, total imports were 171,880 tons compared with 186,395 tons in 1949 though Australian shipments improved by some 14,000 tons. Consumption, however, was almost identical with the previous year at 328,123 tons compared with 328,329 tons. Of this 222,199 tons was virgin lead, and 95,929 tons derived from scrap. Stocks after starting at 51,400 tons at the beginning of the year improved to 81,300 tons at the beginning of August only to decline again at 62,000 tons at the end of December since when they have considerably shrunk, and were down to 45,311 tons at the end of February in the current year.

The uses to which lead is applied vary considerably in the United States and Great Britain and the classifications are somewhat different. In the United States the chief consumption last year was for storage batteries, the lead from which re-circulates in about three years. The total is estimated at around 405,000 s.tons. Cable sheathing is put at 140,000 s.tons, tetraethyl 110,000, solder 95,000, red lead and litharge 90,000, building industry 67,000, calking 60,000, ammunition 36,000, white lead 35,000, bearing metal 32,000 and type metal 31,000, miscellaneous uses 106,000 s.tons.

In Great Britain chief consumption was for cable making, 86,163 tons, sheet and pipe required 80,877 tons, oxides 60,158 tons, batteries 27,518 tons, solder 12,696 tons, alloys 15,248 tons, foil and collapsible tubes, 4,335 tons, miscellaneous 17,420 tons.

Canadian production showed a moderate increase at 169,888 s.tons (of which 116,166 tons were exported) compared with 159,775 s.tons in the previous year.

As regards Mexican output we have no authoritative figure. It has been stated in Mexico that the monthly average output in 1950 was 19,840 tonnes, which gives a total for the year of 238,080 tonnes, some 6,000 tonnes above the 1949 output. According to the Bureau of Mines some 220,000 short tonnes were imported into the United States from Mexico last year.

Australian production showed little change on the 1949 figure of 209,291 tons as though Broken Hill improved somewhat Mount Isa fell off. The smelter output for eleven months was 188,250 tonnes.

Smelter output of W. Germany is computed at 119,240 tonnes, of France 60,030 tonnes, and of Italy 37,470 tonnes.

Production in Spain picked up sharply and last year reached 39,456 tonnes with the prospect of further improvement up to 48,000 tonnes in the near future when all the new dressing plants get into operation.

Yugoslavian production may have approached 50,000 tons.

The Northern Rhodesia production showed little change on the 1949 figure totalling 13,685 tons against 13,145 tons.

**Price**

In the United States the market opened at 12c. per lb. and declined at 10.50c. on March 14, which was the lowest quotation for the year. By May 11 it had recovered to the opening figure of 12c. declining to 11c. at the end of June. Thereafter the price advanced steadily to 17c. at the end of October, where it was stabilized by the large suppliers probably by some arrangement with the Government. Towards the end of the year there was a tendency for foreign lead to be quoted higher, and when the increased tariff became effective on January 1 last, buyers had to pay 18½c. for imported lead, a figure which has since advanced to around 20c.

In the U.K. the price opened at around £97 per ton, and was reduced to £84 in the middle of March, after which it rose to £96 in May, but was back to £88 at the end of June. From there price increased rapidly to £92 on July 13, to £96 on the next day, to £104 on August 16, £112 on August 22, £120 on September 2, £128 on September 9, and £136 on November 1, where it remained for the rest of the year. Since then the Ministry of Supply selling price has been advanced to £160 at the time of writing. During most of the year the Ministry of Supply selling price was in step with the New York quotation, but it was believed in New York that they were sometimes buying parcels at a premium.

# Zinc

By E. BALIOL SCOTT

ZINC, like its sister metals, experienced a tremendous year in 1950, and if the American price—and with it the English and world price—did not double, this was due to the United States "official" price being pegged at 17.50c. per lb. after the first week in September. Outputs in producing countries, so far as they are available at the time of writing, show big or substantial increases, but an exceptional industrial consumption, coupled with big U.S. stockpile acquisitions, largely outran the production increase and induced a grey market greatly exceeding the official prices by the end of the year. In fact, the shortage of zinc supplies became more notorious than that of any of the other industrial metals, and first attracted use limitation orders.

## Production

Production from the U.S. domestic mines in 1950 was 618,207 s.tons against 593,203 s.tons in the previous year, while imports of concentrates were approximately 266,000 s.tons. Altogether the U.S. production of slab zinc was approximately 910,000 s.tons. Another 85,000 tons was drawn from smelters' stocks, making a total of U.S. smelter shipment of some 995,000 s.tons of slab compared with 800,000 s.tons in 1949. In addition, 155,000 tons of slab were imported, bringing the supplies available to a grand total of 1,150,000 s.tons.

The Canadian output has been reported as 311,225 s.tons as compared with 288,262 s.tons in the previous year. The Belgian output is reported as 182,000 tonnes, equivalent to a rise of 10,000 tonnes. Italian production also improved and is reported as 38,120 tonnes, an increase of 9,650 tonnes. The Australian output of concentrates showed a slight increase on the 1949 figure of 176,000 tons, and electrolytic zinc was also slightly higher at 83,811 tons against 80,956 tons. Smelter outputs for West Germany and France are given as 122,810 and 69,770 tonnes respectively.

## Consumption

Consumption showed an exceptional increase generally, especially in the U.S., where the total was 950,000 s.tons against 711,843 s.tons in 1949. All grades showed record or near record figures. Details were: Prime Western, 352,389 s.tons; special high grade, 263,940; regular high grade, 113,310; intermediate, 26,286; brass special, 30,104; selected, 2.811; and re-melt, 2,002. Export is estimated at 20,000 s.tons and drawbacks and Government stockpiling at 128,000 s.tons.

In the U.K. the year's consumption was 328,155 tons compared with 286,116 tons in 1949. Consumption details for other countries are not yet available.

U.K. imports of zinc were 141,918 tons compared with 143,451 tons in 1949. Imports from Belgium increased largely to 45,938 tons; Australia was practically unchanged at 35,056 tons, but U.S. imports were almost halved at 15,527 tons and Canada was substantially down at 32,165 tons. These figures illustrate the increasing difficulty of importing from hard currency countries. In addition, concentrate imports were almost unchanged at 197,718 tons (say 85,000 tons of metal), of which Australia contributed rather over a half and Canada (now including Newfoundland) at 30,491 tons, about 1,500 tons more than in 1949.

## Price

One of the most outstanding features of the year was the great increase in price. East St. Louis opened with Prime Western at 9.780c. per lb., and was pretty steady up to the middle of March. After that a gradual rise ensued up to 15c. at the beginning of September, when the "official" price was raised to 17.5c., at which it remained for the rest of the year. But gradually the amounts obtainable at this figure contracted, and a substantial grey market was established, estimated at around 27c. in the first quarter of the current year. In Great Britain the Ministry of Supply, generally speaking, conformed its selling prices to those ruling in America for export, but especially towards the end of the year American reports were that they had paid up to 6c. over the U.S. "official" price. Their official selling price at the beginning of the year was £87 10s. for G.O.B. rising to £151 at the end of the year.

In zinc, as with the other metals, U.S. strategic stockpile acquisitions were probably the last straw in producing the great world shortage experienced towards the end of the year and extending to the current 12 months. As already mentioned, the total stockpile purchases for 1950 amounted to 128,256 s.tons as compared with 92,000 s.tons in 1949, and the total holdings have been estimated in some quarters at not far short of 600,000 s.tons. Frequent representations were made by the trade for the suspension of this policy, and even for some releases from stock, and though details are not available the U.S. Administration is believed to be meeting these representations to some extent.

## Rationing

A policy of rationing consumers has been adopted both in the U.S. and in Great Britain, but the full severity has still to be experienced, and with the International Metals Committee examining the position in Washington, the possibility of an equitable allocation to the N.A.T.O. countries has yet to be worked out.

Many efforts to stimulate production have been mentioned, specially in the United States, as it is recognized that the exhaustion of stocks and the shortage of concentrates are factors which must be overcome before any permanent improvement in the outlook can be effected. But the zinc industry is a complex one and depends, perhaps more than other branches of metal mining, on a comparatively few big organizations. The capital cost of new zinc plants, with their complex reduction processes, is beyond the scope of smaller enterprises. The war exhausted mine reserves of zinc ore and the grade has been lowered; scrap supplies are reduced. In 1950 available supplies of concentrates, domestic and foreign, were estimated at 847,000 s.tons and requirement at 980,000 s.tons. Without more concentrates smelters cannot enlarge their production of slab. Labour costs have advanced greatly and the effects of the depression experienced in 1949 are not quickly to be overcome. Moreover, as with all the major non-ferrous metals, there has for many years been little in the way of new discoveries of zinc deposits capable of yielding any substantial output and any such require years to bring to fruition.

Thus, unless consumption is curtailed for a period, the prospect of a restoration to orderly conditions seems remote. The panel of the International Committee face a full-sized job.

# Aluminium

By A. GRAHAM THOMSON

DESPITE the pressure of rearmament and stock-piling, and existing or pending curtailments of civilian use, aluminium is in a strong and stable position compared to other metals. In 1935 aluminium cost 10.7c. per lb. more than copper. In 1950 it was underselling copper by 3.8c. Though aluminium prices have recently increased, the rise has been far less spectacular than that of copper and other competitive metals. Stockpiling and rearmament may prevent aluminium from taking immediate advantage of the many commercial fields awaiting further exploitation, but gains are likely to be made at the expense of copper and also steel. Factors pointing to a long-term expansion of peacetime consumption include growing consumer acceptance of aluminium products, technological developments, the increasingly critical supply of other metals and a favourable price relationship with other metals. It is noteworthy that the new plant units in the United States will all be strategically located with a view to the further acceleration of peacetime consumption when military demands subside.

## The Supply Position

The world output of primary aluminium during 1950, excluding the U.S.S.R. and satellite countries, is estimated at 1,396,000 s.tons (see accompanying table), an increase of some 12% over 1949. Production of the U.S.S.R. and satellites is believed to have been in the neighbourhood of 235,000 s.tons.

Despite the high level of production, supplies of aluminium became increasingly tight as the year went on, and even before the outbreak of war in Korea a shortage was evident in the United States. Large programmes to expand ingot and fabricating capacities are proceeding in various countries. With a view to stimulating domestic production the U.S. Government assured aluminium producers of a number of measures of help and support, including responsibility for the sale of the output of expanded factories for five years, either to the industry or to the Government stockpile. The three leading United States producing companies are associated with a programme designed to effect a 68 per cent increase in the nation's productive potential by mid-1952. In Canada Alcan has been authorized to push forward plans for hydro-electric development at Chutte du Diable and Chutte Savanne at a cost of $30,000,000.

E.C.A. funds are being used to finance expansion projects in non-dollar countries. Early in the year a contract was signed with the Reynolds Metals Co., in which E.C.A. agreed to advance up to $5,963,000 in Marshall Aid dollars and £1,800,000 in counterpart funds to establish a bauxite project in Jamaica. In September it was announced that funds amounting to $2,500,000 and £1,500,000 would be advanced by E.C.A. to Jamaica Bauxite Ltd., a subsidiary of Aluminium Ltd. The money will be used to finance the construction of a plant having a production capacity of about 40,000 tons of alumina a year. Repayment of both advances will be made in the form of aluminium for addition to the United States stockpile. The total world output of bauxite during 1950 is estimated at 6,500,000 l.tons, excluding U.S.S.R. and satellites.

During the year a delegation of technical experts from Aluminium Ltd. and the British Aluminium Co. visited Accra to study schemes put forward by West African Aluminium Ltd. for the production of hydro-electric power at Ajena on the Volta. The local company has concessions at Yenedin in Ashanti where some 200,000,000 tons of bauxite await development. The Gold Coast's expansion programme has a target of 300,000 l.tons of bauxite a year by 1952.

These same companies also have under consideration an alternative £30,000,000 scheme for producing aluminium in North Borneo.

In co-operation with American interests Norway has planned to start a new aluminium works in Sunndalsoyra, in addition to the present works at Ardal. The new works are to be sited near the Aura electric power station and will have an output of 44,000 s.tons of aluminium per year. France has overcome her reconversion problems and last year produced 67,000 s.tons of virgin metal. The establishment of large aluminium industries in Australia and India is projected.

**PRIMARY ALUMINIUM PRODUCTION**

Excluding U.S.S.R. and satellite countries (in thousands of short tons)

| | 1948 | 1949 | 1950 |
|---|---|---|---|
| U.S.A. | 623 | 603 | 719 |
| Canada | 367 | 367 | 396 |
| France | 71 | 60 | 67 |
| Norway | 34 | 39 | 51 |
| U.K. | 34 | 34 | 33 |
| Germany | 8 | 32 | 31 |
| Italy | 36 | 28 | 29 |
| Japan | 8 | 23 | 26 |
| Switzerland | 21 | 23 | 23 |
| Austria | 15 | 16 | 13 |
| All other countries | 8 | 9 | 8 |
| TOTAL | 1,225 | 1,234 | 1,396 |

In Germany the Vereinigte Aluminiumwerke at Lünen resumed production with an output of about 600 tons a month. Special assistance was promised to the West German aluminium industry by the E.C.A. Special Mission, to the extent of D.M.3,000,000 and by the promise of 450,000 tonnes of Greek bauxite in the next three or four years. The amount to be exported for the U.S. stockpile has been reduced and the total, including the repayments in metal for the E.R.P. loan and bauxite purchases, will be around 38,000 tonnes against earlier estimates of 100,000 tonnes.

A major development in Britain was the opening of the new continuous strip mill installed by the Northern Aluminium Co. on the Rogerstone site at Newport. Not only will its output increase the existing British sheet rolling capacity by more than a third, but its potential, contingent on the provision of additional cold rolling plant, is as high as 150,000 l.tons a year.

## Britain's Requirements

Britain's aluminium industry is dependent for its supplies of ingot on two main sources—17 per cent home produced in the Highland Reduction Works of the British Aluminium Co. and the balance largely from Canada. In the years 1949-50 virgin aluminium consumption was approximately 180,000 l.tons a year and secondary approximately 70,000 l.tons. Given unrestricted supplies, however, the fabricating industry could probably use 275,000 l.tons of virgin metal during the current year. In December Mr. George Strauss stated in Parliament that supplies of both primary and secondary metal were adequate for the defence programme, but the shortage of scrap was affecting the supply of secondary metal for foundries. A bleak outlook for industrial consumers was ameliorated by the news that arrangements had been concluded with Canada for a further 50,000 l.tons, supplementing the 150,000 l.tons previously arranged for, which with home production at 30,000 l.tons, would provide a total U.K. aluminium supply in 1951 of 230,000 l.tons. It has been stated that total supplies of 250,000 l.tons a year are assured for 1952-53. A substantial proportion of the increased supplies, however, are likely to be earmarked for the Ministry of Supply.

# Beryllium

By RALPH F. BATTY, A.R.S.M.

DURING 1950 there was a considerable expansion of supplies of beryl ore from African sources and a very substantial reduction in exports from South America.

In 1949, production from all African sources amounted to not more than 600 tons of ore with approximately 10 per cent BeO content of which 246 tons represented output from the Union of South Africa and 263 tons South-West African output. By comparison, the 1950 output appears to have almost doubled, as production for the first nine months was 928 s.tons.

**Progress in Southern Rhodesia**

A report published by the Southern Rhodesia Government gives some interesting details of the initiation of beryl mining there. The principal producer is the Manvekup mine in the Bikita area where a massive white variety of crystal is obtained. Apparently a major difficulty in developing production has been that experienced by the miners themselves in distinguishing beryl from quartz, and much is hoped for from a new method of testing which appears to offer a satisfactory solution. The high price (a 10 per cent BeO ore is valued at £80 per ton) has stimulated prospecting and working. Southern Rhodesian output for 1950 was 932 s. tons.—a fine showing for an entirely new producer.

African developments have been particularly satisfactory since they compensate for the decline in Brazilian supplies. Whereas in the first 11 months of 1949 imports from Brazil into the U.S.A. amounted to 3,100 s.tons, the corresponding figure for 1950 was only 2,400 s.tons. Imports from Brazil accounted for 96 per cent of the total in 1949; in 1950, of a larger total import, they were reduced to 55 per cent.

Most beryl producing countries now exercise a strict control over exports by licensing or other means. Export from the Union of South Africa or South-West Africa is prohibited except under licence from the Atomic Energy Board, and export licences are required in Rhodesia.

At the end of September all stocks of beryl ore held in the Argentine were requisitioned by the government through the Bank for Industrial Credit which will henceforth be the only buyer. Argentina was a very large producer of beryl ores some ten years ago (in 1939 production amounted to 2,186 tonnes of 11 per cent BeO ores), but in recent years there have been very few export shipments and it appeared that Argentine sources had been worked out.

No information is available as to current U.S. production of beryl ores, but there was a record production of 475 tons in the U.S.A. in 1949.

**American Shipments**

A new property is now being developed in Canada near Mount Laurier, Quebec, by Northern Canada Mines and the Kirkland Lake Gold mining company. Some beryl ores are being shipped to the U.K. and possibly Australia but the bulk move to the U.S.A. for processing. The U.S.A. ships large quantities of beryllium master alloy mostly to Canada, the U.K. and Sweden. In the first 11 months of 1950, total U.S. exports of beryllium metal alloys were 202,800 lb. compared with 185,200 in the corresponding period of 1949. Of the 1950 total 133,500 lb. were exported to the U.K. (128,400 lb. in 1949). 32,700 lb. to Canada (14,300 lb. in 1949) and 24,400 lb. to Sweden (24,500 lb. in 1949). The continued large exports to Sweden are somewhat surprising for large quantities appear to be needed mostly for the sheathing of uranium in atomic piles, and little has been heard of Swedish developments in atomic energy.

# Magnesium

By RALPH F. BATTY, A.R.S.M.

IN one important respect the Western powers enjoy a considerable advantage in securing adequate supplies of magnesium. Their technique of manufacture from indigenous raw materials, developed at great cost during the last war, is now well enough established for the solution to the problem of large scale production required for the rearmament programme to be mainly a matter of reopening the required electrolytic conversion capacity which is already in existence. During 1950, the existing large buffer stocks of primary and secondary metal were largely absorbed and by year end provision was being made for bringing reserve capacity back into production.

Present indications are that production outside the U.S.S.R. in 1950 (including some secondary metal) was in the region of 21,000 tonnes representing an increase of nearly 40 per cent compared with 1949. Production in the U.S.S.R. is believed to be over 5,000 tonnes annually.

In Europe, the U.K. and France were the principal producers, the latter accounting for 450 tonnes of primary metal and the former for several thousand tonnes of secondary metal recovery. However, in October there were reports that the Norwegian plant at Heroya with a nominal capacity of 3,000 tonnes annually was to be reopened though full production was not expected till late in 1951.

The Dominion Magnesium Co.'s plant in Canada was brought back into production about the middle of the year and by mid-November not only had the stockpile, built up by the end of the war, been absorbed but deliveries, mostly to Europe and Scandinavia, were being rationed. Production of primary metal amounted to 1,600 tonnes in 1951 and by the end of the year was at the rate of 450 tonnes monthly.

In the United States the Dow Chemical Co. opened up new lines at the Freeport plant and increased the rate of output by the end of the year to over 1,800 tonnes per month, just over double the 1949 average. Early in 1951 arrangements were made for the big Velascos government-owned plant in Texas to be reopened and managed by Dow. The present programme is to make 72,000 tonnes in two years beginning in May, 1951 to be sold to the U.S. Government for stockpiling at ruling prices. A similar arrangement has been made by the Kaiser Magnesium Co. who are reopening the Manteca (California) plant in order to make 18,000 tonnes in two years for the stockpile. Apart from stockpiling it seems likely that some additional government-owned capacity will be available for current consumption.

Although there has been some increase in magnesium consumption in Europe the details recorded by the Ministry of Supply for U.K. deliveries of wrought products in 1950 showed only a 6 per cent increase. Sheet and strip production was slightly lower than in 1949 the advance being entirely in castings. It is clear that at present the main field for extensive use of wrought magnesium products is in heavy aircraft production which is centred in the United States. It is not surprising, therefore, that the Dow company's programme provides for the installation at their Madison (Illinois) plant, of substantial extrusion and rolling capacity. Here the new continuous rolling method is to be employed, presumably using the ternary magnesium-zinc-zirconium alloys.

During the year there were two substantial price increases, first an advance to 1s. 9½d. per lb. for ingot, the price ruling until December, and then a further increase of just over 16 per cent to 2s. 1d. per lb.

# Asbestos

By A. S. ROSSITER

THE year 1950 was the biggest year the asbestos mining industry ever had. All the figures are not in, but Canada alone produced, according to preliminary estimate by the Dominion Bureau of Statistics, 877,650 s.tons of asbestos crudes and fibres, compared with 574,906 tons in 1949 and 714,717 tons in 1948. The 1948 figure is given because the tonnage figure for 1949 is not a fair criterion as Canadian miners were on strike for about five months during that year.

During the first ten months of 1950, the United States imported from all sources 563,886 s.tons of crudes and fibres, and of this quantity 542,156 tons came from Canada. Of this 542,156 tons, however, 395,931 tons were what is known as "shorts" (grades lower than used for the manufacture of asbestos paper). The increasing use of these short fibres was one of the outstanding features of 1950, and it is one reason for the opening of the new Munro mine in Ontario by Johns-Manville Corporation, considered as an outstanding event of the year. Other mines producing short grades are being considered and some actually preparing to open soon.

The United States has an important producer of short asbestos fibres, the Vermont Asbestos Mines, owned by The Ruberoid Co. United States production during 1950 was approximately 42,000 s.tons—in 1949 the production was 42,918 s.tons—the larger proportion of this tonnage was of the shorter grades—shingle, paper and shorts—no itemized figures are obtainable.

The output of Southern Rhodesia was substantially down on the year at 71,527 s.tons as compared with 79,638 s.tons in 1949, but the value was higher at £4,615,490. The South African output on the other hand was higher and amounted to 87,378 s.tons as against 70,725 s.tons in the preceding year. Blue Asbestos output rose to 29,367 tons; amozite to 43,712 s.tons; while chrysotile almost doubled at 14,301 s.tons.

In Cyprus the output also improved to the record figure of 14,569 tons as compared with 11,098 tons in 1949. We have no figures so far from Italy which had a production of some 15,000 tons in 1949. Production in other countries is unimportant. We have no information regarding the U.S.S.R., where the output is no doubt considerable.

Prospecting during the year was stimulated by the very keen demand, but so far nothing substantial in the way of new production has been reported apart from the Munro mine in Ontario, noticed earlier.

The year 1950 was devoted to many research projects in the asbestos industry, some technical, some practical. So far as the technical subjects are concerned, perhaps the most interesting from an overall point of view is the theory recently put forth that asbestos fibres in the last analysis are tubular in form rather than solid (see February, 1951, *Asbestos*, page 12, "Are Asbestos Fibres Tubular?").

From a practical standpoint, the development of asbestos for air filters, thus making possible a practical application of asbestos filters for the cleaning of air, not only of industrial dust, and other common pollution, but from airborne radio-active dust particles found in connection with atomic energy operations, has been a feature of the year. This may be more important in the future than we realize at this time. In any case it is one reason that we claim 1950 to have been a year of tremendous importance in the asbestos production industry. The potential uses of asbestos crudes and fibres are unlimited, and many who have spent years in the asbestos industry are just beginning to realize its possibilities.

# Titanium

MARKED progress in the development of titanium as an engineering metal was achieved during 1950. Estimates place the production of titanium sponge during the year at over 200,000 lb. Commercial purity titanium (approximately 99.5 per cent) was offered in limited quantities in a wide range of fabricated products. Production of 1,000-lb. ingots was reported.

The U.S. Bureau of Mines continued operating its titanium pilot plant, while commercial production using modifications of the Kroll process was undertaken by E. I. du-Pont de Nemours and the National Lead Co. During the year Rem-Cru Titanium, Inc., jointly owned by Remington Arms Co. and the Crucible Steel Co. of America, was formed to make titanium and titanium alloy products. The Titanium Metals Corporation of America was organized by the National Lead Co. and Allegheny Ludlum Steel Corporation to market and distribute titanium and its alloys. Sharon Steel announced its intention of going into the titanium sheet business.

In Canada, Dominion Magnesium is producing titanium powder and pellets for use in high-temperature alloy and stainless steel at a pilot plant at Haley, Ontario, using the Pidgeon process originally developed for magnesium.

Research on the metal continues to be carried out by metallurgists in the United States and Britain to determine its working and alloying properties. The principal work done to date has been in fields where a high ratio of strength to weight is needed (as in aircraft) and where corrosion-resistant materials are required. Manufacturers of high-speed aircraft believe that the extremely high melting point of titanium (3,140°F.) will make it ideal for jet engines. In the annealed condition the strength of unalloyed titanium compares favourably with that of stainless steel and higher strength aluminium alloys, but it can be greatly increased by cold working or alloying.

**Ilmenite**

With an output of 467,300 s.tons of ilmenite, containing 238,150 tons $TiO_2$, the United States remained the world's largest producer of this ore. Imports of ilmenite from January to October inclusive were 177,000 s.tons, representing a decrease of 40 per cent compared with the corresponding period of 1949. India again dominated the list of suppliers, but at 157,000 tons, Indian exports to the U.S. for the ten months represented a decline of 43 per cent. Norway and Canada each produced around 100,000 tons.

The Quebec Iron and Titanium Corporation (jointly owned by the Kennecott Corporation and New Jersey Zinc) started smelting operations in October, 1950. Ilmenite for the initial smelting operations is obtained from a small ore body near Grader Lake, some two miles south of the Lake Tio deposit. According to the U.S. Bureau of Mines this deposit is estimated to contain more than 125,000,000 tons and is said to be the largest known deposit of its kind in the world. Reserves of proved ore constitute over 225 years' supply at the initial treatment rate of 1,500 tons per day. The ore contains around 35 per cent $TiO_2$ and 40 to 42 per cent Fe. A temporary crushing plant has been built near the loading dock at Havre St. Pierre, which will be linked by a rail line approaching completion. A permanent and larger plant at Lac Tio will be constructed. Loading facilities can handle 2,000 to 2,800 tons an hour. At the Sorrel smelter a 750-ton, 20,000-kW. furnace has been installed. Plans call for the installation, beginning in the Spring of 1951, of four additional units. Titanium oxide slag and pig iron will be produced at an ultimate annual rate of 250,000 and 175,000 tons, respectively.

# Nickel

IN the face of a slightly declining output, the demand for nickel in its various forms became increasingly acute and actual deliveries would appear to have exceeded those of 1949. The Canadian Dominion Bureau of Statistics, in its preliminary estimate, gave the Canadian output as 123,057 s.tons compared with 128,690 s.tons in the previous year. On the other hand, the International Nickel increased their sales from 104,646 s.tons to 128,205 s.tons. Usually this great company carries considerable stocks of mined material, and, as the first half of 1949 was a period of recession, the material in reserve may have been larger than usual. Elsewhere, Falconbridge Nickel output remained at some 9,000/10,000 tons.

Production of nickel in France showed little change and has been reported at approximately 3,950 tonnes. Presumably the Russian output was at least maintained, but as this is entirely consumed internally it does not affect the world supply.

The prospect of an increasing scarcity in nickel led to unexampled activity in development and prospecting. The International Nickel has been engaged for some ten years on the development of ore reserves underground to replace deposits worked from the surface as these became exhausted. In the year under review $13,500,000 were expended on such underground development and in the current year the bulk of the capital expenditure of $20,000,000 is allocated to the same object. The programme envisages an increase in the underground ore reserves to double any previous figure. Falconbridge Nickel also is committed to large development expenditure both in Canada and in the Kristiansand refinery, where the capacity is expected to be enlarged to some 16,000 tons a year by the end of 1951, with prospects of large reserves of ore being made available on their Levack property. The Sherritt-Gordon mines have been pushing development at their Lynn Lake properties, and may begin shipping on a small initial scale to the U.S. Munitions Board this spring.

In Cuba, the Mine Equipment Corporation of New York is to re-open the Nicaro nickel-oxide plant, closed down after the war, for the United States Government, where, the capacity is around 16,000 s.tons a year and a new process is under trial, dealing with cobalt as well as nickel-oxide; production is expected to start early next year. Outside Sudbury the International Nickel is also interested in Reed Lake, Rice Island, and Mystery Lake in Northern Manitoba, but a report that they were seeking licences over large areas in the Dodoma and Kondoa districts of Tanganyika was promptly contradicted. Nothing more has been heard of their activities in Venezuela. Our Brazilian correspondent reported at the end of the year that a Canadian company had obtained a concession to exploit nickel deposits at São José de Tocantins, near the river of that name.

The Nickel Corporation of Africa started operations at the old Mount Ayliff occurrences in Griqualand and a £750,000 company was formed.

As regards consumption, in addition to stockpile buying industrial demand was maintained in all directions; in particular, research was directed to the production of products having high temperature resistance for use in the gas turbines of jet-propelled aircraft.

The price of nickel was twice raised during the year by Inco to 48c. per lb. in the U.S. on June 1, and £386 per ton in the U.K., and again to 50½c. per lb. in the U.S. on December 13, and to £406 in the U.K.

# Manganese

IN 1949 supplies of manganese imported for United States consumption amounted to 1,544,526 s.tons. The initial effects of rearmament were reflected in a substantially higher figure for 1950, total imports for the year being estimated at 1,800,000 tons. A breakdown on the basis of the first nine months of the year showed a ranking of total imports to be: India, 34 per cent, South Africa, 27 per cent, Gold Coast, 17 per cent, Brazil, 8 per cent, Cuba, 5 per cent, U.S.S.R., 3 per cent, the remaining 6 per cent being divided among Angola, Belgian Congo, Chile, French Morocco, Greece, Mexico, the Philippines and Turkey.

The United States domestic production comes predominantly from Montana and is in the vicinity of 100,000 tons a year. Consumption of manganese ore in the United States for 1950 is estimated at 1,600,000 s.tons. If consumption of imported ferro-manganese—mainly from Norway, France and Canada—is evaluated in terms of ore and added to this estimate, the total exceeded 1,800,000 tons. At the end of the year consumer stocks were expected to approximate 800,000 tons.

**U.S. Buying Boosts Production**

Heavy United States buying led to a further steep rise in world production. Such was the demand during 1950 that overseas buyers in South Africa were reported to be contracting for quantities of low-grade material hitherto almost unsaleable. During 1950 South African production amounted to 836,667 s.tons, compared with 722,211 tons in the previous year. A coal-loading plant in Durban has been diverted to manganese and more trucks, shipped by Canada and made from steel supplied for this purpose by the United States, have been put into service. Thus, the bottlenecks in loading and transport, which for several years restricted shipments, are gradually being overcome.

Exports from India during 1950 amounted to 206,912 l.tons. India's reserves are estimated at 10,500,000 tons for the first-grade mines and 3,000,000 tons for the second-grade mines. The long-term prospects are considered favourable for a large increase of production in India, but producers are at present handicapped by lack of sufficient rail facilities.

**U.K. Imports**

United Kingdom imports of manganese ore for 1950 at 403,884 tons were slightly above those for 1948 (395,777 tons), but were far below the 470,888 tons imported during 1949. The Gold Coast was the chief source of Britain's supply with 195,549 tons. At 95,270 tons, supplies from South Africa have increased, but shipments from India declined from 109,552 to 106,062 tons.

Russia, probably the world's largest producer of manganese ore, remains an enigma. Valuable cargoes continue to be shipped occasionally to the U.S., while under the Russo-Belgian-Luxembourg trade agreement of November 16, Russia will supply *inter alia* 25,000 tonnes of ore.

Brazil's 1950 exports of manganese ore are estimated at 153,000 tonnes, mainly from Meriodional's mines at Morra da Mina, Minas Geraes. The Urucum mines in Mato Grosso, where reserves total 33,600,000 tonnes, can only export through Argentina, thus increasing costs. The Amapa beds, discovered in 1946 and provisionally estimated at 20,000,000 tons, are being developed by a national company (I.C.O.M.I.) in which Bethlehem Steel owns 49 per cent of the shares. Bulk exportation should begin in 1954, after a railway and port have been constructed.

The discovery of promising deposits of manganese ore has been reported from South-West Africa.

# Tungsten, Molybdenum and Vanadium

By RALPH F. BATTY, A.R.S.M.

THE magnitude of the rearmament programmes embarked upon by the Western powers during 1950 was such as to necessitate very extensive tooling up in a short space of time. It is hardly surprising, therefore, that with available resources strained to the uttermost to keep pace with demand there was, towards the end of the year, a spectacular rise in price of the ferro-alloying elements used in high speed tool steels, particularly that of tungsten.

**Tungsten**

In January, 1950, the U.K. price for good 65 per cent $WO_3$ concentrates was 95s. per unit c.i.f. There was little advance at the outset of the fighting in Korea but by the beginning of July the market quoted 127s. 6d. to 130s. During the next five months prices doubled and in December alone moved from 275s. at the beginning to 380s. to 390s. per unit at the end of the month, to reach much higher figures early in the present year. Shipments of Chinese wolfram to the west almost ceased after the first quarter of the year and the onset of buying found this major source of supply eliminated.

From the incomplete records now available it appears that some 21,000 tonnes of wolfram concentrates (on a 60 per cent tungstic oxide basis) were available during the year for the Western powers and this suggests an increase in world production outside China of about 10 per cent. Although production in Korea, which is approximately equally divided by the 38th parallel, must have been very spasmodic, shipments to the U.S. are reported as 2,403 tonnes. Supplies from the other Asian countries increased mainly because of greater output from Thailand, in the region of 750 tonnes, and the appearance of Japan as a shipper of about 300 tonnes. In spite of some improvement in conditions towards the end of the year in Burma it has still not been possible for the owners of the Mawchi property to reach any agreement with the government for the resumption of operations and this is a serious loss at the present time.

The declining trend in Bolivian production was checked during the year but the increase in prices came rather too late to stimulate production during 1950 from a number of smaller properties. Shipments of Bolivian ores to the U.K. were lower at 670 tonnes compared with 950 tonnes in 1949 but there was a compensating increase in shipments to the U.S.A. In the other South American countries supplies from Argentina almost ceased but there was an increase in Brazilian and Chilean output. Most of these ores were shipped to the U.S.A. and in total they accounted for 18 per cent of 1950 imports compared with less than 2 per cent in 1949.

U.S.A. production was approximately 4,000 s.tons of 60 per cent concentrates with imports for consumption from all sources amounting to 10,760 tonnes (60 per cent $WO_3$ basis) during the first eleven months of 1950 compared with 5,160 tonnes in the previous year—but in that year very large shipments for government stockpile account were separately recorded.

Notwithstanding the large imports during the year the National Production Administration was, at the end of the year, seeking the curtailment of use of tungsten by American manufacturers and early in 1951 the Defence Mineral Administration began discussions with the tungsten mining industry about increasing domestic production. It is anticipated that production could be increased fourfold in about two years with assured prices.

Imports of wolfram ores into the U.K. during 1950 were substantially the same as in 1949—5,831 compared with 5,736 tons. Shipments from Australia, Burma and Bolivia were smaller but were offset by larger shipments from Portugal, Spain and the South African countries.

**Molybdenum**

At the end of December the ruling U.K. price for 85 per cent concentrates was 103s. 6d. c.i.f. per unit, an advance of 70 per cent during the year. U.K. imports were substantially larger in 1950 than in 1949 amounting to 3,086 tons compared with 2,631 tons. It seems likely that part of the increased import was for the stocking up.

An acute shortage of molybdenum had developed by the end of the year and American producers were finding it impossible to keep abreast of domestic and export demands. Whereas stocks at the end of 1949 represented almost eleven months consumption (including export deliveries), they were reduced to only about three weeks supply by the end of 1950. Not only had domestic consumption greatly increased but export shipments in the first eleven months of the year totalled 5,700,000 lb. molybdenum content compared with 4,800,000 lb. in the corresponding period of last year.

In the U.S.A. the National Production Administration issued a directive that there should be no deliveries of molybdenum by the producers except on orders with a D.O. (Defence Order) rating; it will also only be supplied on steel orders with a defence rating. In an effort to ensure maximum domestic production the U.S. government has made an agreement with the Climax Molybdenum Co. whereby the company guarantees maximum operation of its property at Climax, for five years.

**Vanadium**

World production of vanadium in ores and concentrates was probably about 1,900 tonnes ($V_2O_5$ content) in 1950 compared with about 1,800 tonnes in 1949. Supplies from African sources were smaller but increased output from American sources more than offset their loss.

The Rhodesia Broken Hill Development Co. Ltd. ceased production of fused vanadium pentoxide as from the beginning of the year because the leaching plant used in the process was being employed for testing a process for the recovery of zinc and vanadium from mixed fines tailings. The chairman of the company, in reporting this in the middle of the year, could not say how present operations were likely to affect future output; there might eventually be an increase from this source which, in 1949, produced 331 tons of 92 per cent $V_2O_5$ fused vanadic oxide. Substantial stocks of fused vanadic oxide had been held in Northern Rhodesia and these were largely shipped in 1950; as a result exports to the U.K. were greater in 1950 at 211 tons than in 1949 (100 tons).

At the Abenab lead-zinc property of the South West African Co. Ltd. the new flotation mill for the separation of vanadium and lead concentrates was brought into operation on May 1, 1950. S.W. African output of lead-vanadium concentrates (3.5/19 per cent) in the first nine months was 447 s.tons.

Production of vanadium concentrates from the Minas Ragra properties in Peru appears, from shipments to the United States, to have been nearly doubled. U.S. imports in the first eleven months amounted to 1,206 s.tons $V_2O_5$ content in 1950 compared with 615 s.tons in the corresponding period of 1949.

There are indications that the domestic production of vanadium ores in the U.S.A. is rising due to the increased treatment of carnotite uranium bearing ores. In September it was announced that the Climax Molybdenum Co. were building a mill at Grand Junction, Colorado, for the daily treatment of 50/100 tons of carnotite ores from a new property owned by the Minerals Engineering Co.

# Iron and Steel

THE age of steel has not yet passed, or even reached its meridian. That belief is the inspiration of extensive plans in this country and abroad for the further expansion of existing productive capacity. Many of the smaller states hitherto dependent, wholly or in part, upon external sources of supply, are engaged upon projects to satisfy their own requirements; steel capacity in Canada, South Africa and Australia is being increased; the United States' steel industry, already geared to a capacity of 104,000,000 tons a year, intends to further increase its potential by more than 13,000,000 tons within the next two years, and although the original post-war development plan of the British Iron and Steel Federation is not due for completion until 1952/3, that authority has already embarked upon the formulation of a second development plan based upon detailed schemes prepared by individual companies.

All these developments pre-suppose a continuous expansion in the world demand for steel, and the products of the steel-using industries. And yet only a year has elapsed since the Economic Commission for Europe prepared an analysis of the trend of European steel consumption and production which envisaged a surplus output of 8,000,000 tons in 1953.

There was in fact a distinct shrinkage in the demand for steel in the summer months of last year. Saddled with unsaleable surpluses, some of the Western European producers resorted to drastic price cutting in which British and American steel interests refused to participate. The depression proved to be of brief duration. Towards the end of 1950 there was such a marked revival that demand speedily outpaced the supply. Re-armament has since given a further impetus to the market and there is now a world shortage which ensures the prompt disposal of maximum outputs.

The incident does, however, illustrate the difficulty of attaining with any degree of accuracy an appraisal of the probable future demand for steel, upon which must be based, further lines of development. Capital equipment is costly and redundant plant can prove a heavy financial burden. Hence it is of vital importance that the industry, whilst keeping pace with current needs, should not be committed to large expenditures on plant for which there may be no profitable employment.

### Reconciling Requirements and Availabilities

No less essential is it that the most careful estimates of the requirements and availability of raw materials should be considered in the formulation of any projects for the future expansion of the industry. Let the figures speak for themselves. To attain last year's U.K. output of 16,293,000 tons of steel, the tonnages of raw materials consumed were:—

| | Tons |
|---|---|
| Scrap | 10,250,000 |
| Pig iron | 7,430,000 |
| Iron ore | 21,820,000 |
| Coke | 9,900,000 |
| Total | 49,400,000 |

Since the beginning of the current year shortages of all these essential raw materials have developed into a major embarrassment. The coal crisis became so acute that even the steel industry could not be given exemption from the universal cut in the supply of industrial coal and prices, moreover, were advanced by 4s. 2d. per ton.

The Government plan, born out of stern necessity, of importing coal from U.S.A. and other foreign sources had still more unfortunate repercussions, since the diversion of so much shipping to coal transport, created such a dearth of ore carriers that the freights for foreign ores were forced up to fantastic heights, and blast furnacemen were unable to obtain material in sufficient bulk to keep their furnaces in full operation. Add to this a drop of about 50 per cent in the intake of foreign scrap and it will be seen that the slight contraction in British steel production has been due to circumstances beyond the control of the steel makers.

These problems are not being neglected. On the contrary they are being tackled with vigour and resolution. Influenced no doubt by the high cost, as well as the prospect of a continuing scarcity of coking coal, various steel companies have developed the use of oil fuel, and initial results have been so encouraging that more extensive use of this process is contemplated. In the open-hearth steel furnaces there have been wide conversions for the substitution of oil fuel for coal, and it is encouraging to observe that the average coal consumption per ton of steel produced in this country has been steadily reduced from 62.7 cwt. in 1923 to 34.4 cwt. in 1950.

Expansion of the raisings of home ores is proceeding at least as rapidly as was originally envisaged in the Lincolnshire area, but in the Northamptonshire ore fields the difficulty of recruiting labour—mainly due to the housing problem—has hitherto prevented the expansion which had been planned.

### Development of New Fields Key to Expansion

The conclusion is that the main possibility of expanding iron ore supplies lies in the development of new ore fields overseas. This is a long term project in which not only British, but also European and American interests are closely concerned. Intensive exploration has focused attention upon many new sources, but in every case exploitation of proven reserves calls for huge capital expenditure over a period of years before there can be any substantial yield.

Canadian and American steel makers attach great importance to the spectacular discoveries in Quebec and Labrador where proven deposits have topped the 400,000,000 ton mark. Construction of a railway line to link up these deposits with the St. Lawrence promises early availability. From these sources annual shipments of 10,000,000 tons are promised within the next five years and a similar tonnage from the Steep Rock Mines in the province of Ontario whence 1,200,000 tons were shipped during the past year. Such is the importance attached to these big projects that two of the big American steel companies are now committed to the erection of new plants on the east coast for the more economic utilization of sea-borne ore supplies.

South of the Panama Canal other important sources of supply have also been revealed, the most notable of which is the rich iron mountain, Cerro Bolivar, in Venezuela. Reserves of high grade ore in this region are stated to be about 1,300,000,000 tons but, as in the case of the Quebec and Labrador deposits, their location necessitates a big construction programme before the ore can reach the seaboard, involving the construction of a railway 270 miles in length to the coast or a shorter 90 mile line to the Orinoco River.

British and French interests are more closely concerned with a project for the development of the deposits at Conakry on the West Coast of Africa which are expected to yield a total additional output of 1,200,000

tons of ore early in 1953. Discussions are also proceeding with the Sierra Leone Company for the opening up of a new ore field in that country which it is hoped will eventually yield an additional supply of about 3,000,000 tons a year. There are thus well-founded hopes of an easement of the existing pressure on Sweden and North Africa which are still the main overseas suppliers of ore for British blast furnaces.

With the transition to a state-owned steel industry these and kindred problems will ultimately become the responsibility of the Iron and Steel Corporation, and accepting that responsibility the chairman of the board, Mr. Steven Hardie, has already spoken of progressive long term planning for 25 to 50 years ahead to ensure adequate supplies. Obviously estimates of requirements in the year 2001 are subject to a wide margin of error. The more cautious would prefer to limit the calculations to a less distant date.

**British Steel Records**

Heretofore the British steel industry has consistently exceeded every target set by the Government in its annual post-war economic surveys. In a period of four years the ingot output has been raised from 12,725,000 tons in 1947 to the record breaking figure of 16,293,000 tons in 1950. This of course is a modest tonnage compared with the U.S. output of 86,340,000 tons and a reported Russian output of 27,600,000 tons, but British production now exceeds that of any other country in the world, and confidence is expressed in the industry's ability to reach the planned rate of 18,000,000 tons in 1955.

Unable to command anything approaching the extent of the American home market, British steel makers can regard with satisfaction their 1950 export tonnage of 3,181,000 tons which exceeded that of U.S.A. and has been a material factor in restoring the economic balance.

Whether there will be such a large exportable surplus in the current year remains to be seen. Some reduction may be necessary to provide for the claims of the industry engaged on re-armament work. But the continuance of a healthy home demand seems to be assured by the present state of employment in all the big steel-using industries and it is equally satisfactory to observe that the price advances which were authorized on Feb. 21 last to compensate for the rise in coal prices, still leaves the level of British steel quotations well below those of the other major steel producing countries in Europe and America.

**The State Takes Over**

Since this review is strictly non-political, no comment is offered upon the most momentous event of the current year for the steel industry—the transfer to state ownership. Suffice it to say that although resistance was continued to the eleventh hour, the transition was smoothly effected but the Opposition is still pledged to repeal the Act at the earliest opportunity and that opportunity may not be long delayed.

In the meantime the Corporation is not interfering with the day-to-day operation of the iron and steel plants. The various companies retain their individuality, managements retain control and the outward and visible indications of the transfer of ownership are almost imperceptible. The new Iron and Steel Corporation is not however inactive, and it may be assumed that after the expiry of the present "interim" period of quiescence, far-reaching changes in the structure of the industry will be promulgated. In the national interest it is imperative that these changes should not be permitted to imperil the continued expansion of production to keep pace with the growing needs of re-armament, home steel users and export markets in which British enterprise has built up a commanding position.

# The Coal Trade

THE progress of the recovery of the European coal trade from the devastating economic effects of the second world war was continued in 1950, but at a retarded, and in some respects, a more eventful pace. It will be recalled that the original Marshall Plan aimed, in so far as it related to coal and lignite, at the raising of production from 439,000,000 tonnes in 1947 to 584,000,000 tons in 1951, and notably at the discontinuance of the very expensive necessity of conveying many millions of tons of American coal across the Atlantic to British and Continental ports in times of peace. At the outset of the Plan's operation some of the 16 original participating countries feared they had promised by way of assistance more than they could perform. For example, Britain had a production target in its recovery programme under the Plan of 235,000,000 l.tons for 1950, but its performance that year was 216,000,000 tons; and of a cargo and bunker export target of 33,000,000 tons the performance was only 17,000,000 tons. The only commitment over which target and performance agreed was that of 202,000,000 tons in 1950 for inland consumption.

On the other hand, some achievements under the Plan exceeded expectations. When the recovery programme was drafted in 1947 the most hopeful prediction of the Committee of European Co-operation concerning the prospects of recovery was that "the final deficit to be met by imports from the United States should be reduced to 6,000,000 tons in 1951; after which it may be expected to disappear." Actually, American shipments to Europe had declined by 1950 to a negligible 373,000 tons, after having receded from 41,000,000 in 1948 to 9,600,000 tons in 1949; in other words, the Plan had accomplished the release of Europe from dependence on the United States well before the period provisionally fixed for this task had elapsed.

**European Production**

Meanwhile, the hard coal production of Europe had increased from 442,000,000 tons in 1947 to approximately 535,000,000 tons in 1950; but between 1949 and 1950 the rate of expansion had slowed down considerably. Total overall manpower in Western Europe, in spite of an increase of 35,000 in Western Germany, was 26,000 lower at the end of 1950 than at the end of 1949; devaluation complications had been distorting international trade relations; and under conflicting commercial policies the national surpluses of the earlier months were replaced in the later months by shortages. For the six western coalfields (including Great Britain) in these two years the individual figures of production were as follows: Great Britain 220,000,000 tons in 1950 compared with 219,000,000 tons the previous year; Western Germany 111,000,000 and 103,000,000 tons respectively; France 50,700,000 and 51,200,000; Saar 15,100,000 and 14,300,000; Belgium 27,200,000 and 27,800,000; and the Netherlands 12,200,000 compared with 11,700,000 tons; giving a 1950 total of 435,600,000 tons as against 426,866,000 tons in 1949.

The Polish output also increased from 74,100,000 tons to approximately 79,000,000 tons, and that of Czechoslovakia from 17,000,000 to 17,700,000 tons; while other world 1949-50 statistics include increases in the U.S. from 428,000,000 to 497,000,000 tonnes; Australia from 14,300,000 to 16,800,000; South Africa from 25,000,000 to 27,100,000; India (excluding Pakistan) from 31,900,000 to 32,600,000 tonnes.

Important distributional developments, too, last year were the fundamental changes in organisation, chiefly under the influence of the E.C.E. administration. That body abandoned its system of allocations in favour of a "gentlemen's agreement" between exporters and importers, and it has since been perfecting a plan of commercial integration aiming at (*a*) the promotion of sound competitive conditions in the European coal market; (*b*) the maintenance of a reasonable degree of equilibrium between supply and demand for solid fuels; (*c*) the development of conditions conducive to the regular and economic operation of the European coal industry; and (*d*) the assurance that adequate supplies shall be freely available to all consumers on an equitable basis. A committee of scientists is engaged on the establishment of a uniform international system of coal classification and nomenclature, and another body has been delegated the task of studying and preparing periodical reports on consumption, production, and price trends for the guidance of the contemplated integrated organization.

**The Schuman Plan**

A still more momentous step in the direction of greater integration of international scope has been the participation of France, Germany, Holland, Belgium, Luxembourg and Italy in negotiations for the implementation of the Schuman Plan. This revolutionary scheme, announced last May by the French Government, proposes to place the production and distribution of French and German coal and steel as a whole under a common higher authority within the framework of an organization open to the participation of the other countries of Europe, and charged with the task of securing in the shortest possible time the modernization of production and the improvement of its quality, the supply of coal and steel on identical terms to the French and to the German markets, as well as to the markets of other member countries; the development in common of export to other countries; and the equalization as well as improvement of the living conditions of workers in these industries. The British Government, while in complete accord with the objective of pursuing a common policy aiming at peace, European solidarity, and economic and social progress, have refused to commit themselves to the principle of pooling resources under an international authority possessing sovereign powers till they are better informed of the administrative details of the plan, and are waiting to know how these have been affected by the draft treaty initiated in Paris on March 19, 1951, by delegates representing the six above-mentioned countries establishing the European Coal and Steel Community and a draft convention for a transition period of five years.

**British Target**

In Great Britain the Government's "Economic Survey" for 1950 set the industry a target of 202,000,000-207,000,000 l.tons of deep-mined and 13,000,000 tons of open-cast coal in anticipation of inland requirements estimated at between 199,000,000 and 201,000,000 tons, and of a balance of between 19,000,000 and 22,000,000 tons available for export (cargo and bunkers). In 1949 the output performance was 215,100 000 tons (202,700,000 deep-mined and 12,400,000 opencast), and that year's disposals consisted of 195,300,000 tons in the home market and 19,300,000 tons in the foreign trade. Planned national distribution continued to give priority—often to the point of exclusiveness—to the requirements of home consumers, and when internal fuel needs have conflicted with those of overseas commerce, shipments had to be sacrificed.

To what extent this policy diverted labour from mining to surface employments it is difficult to assess, but

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|---|---|---|---|---|---|
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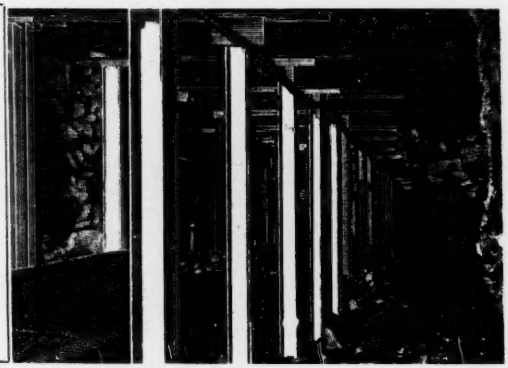
| 3½in. | x | 3½in. | x | 13 ,, | ,, ,, |
| 4in. | x | 4in. | x | 13 ,, | ,, ,, |
| 4in. | x | 4in. | x | 15.75 | ,, ,, |
| 4½in. | x | 4½in. | x | 18 ,, | ,, ,, |
| 5in. | x | 3in. | x | 14 ,, | ,, ,, |
| 5in. | x | 4½in. | x | 18 ,, | ,, ,, |
| 5in. | x | 4½in. | x | 20 ,, | ,, ,, |
| 5in. | x | 5in. | x | 21 ,, | ,, ,, |

**METRIC SIZES (Approx)**

| | | | | | |
|---|---|---|---|---|---|
| 75 m/m | x | 75 m/m, | | 15 Kgms/m. | |
| 90 ,, | x | 90 ,, | | 20 ,, | |
| 100 ,, | x | 100 ,, | | 20 ,, | |
| 100 ,, | x | 100 ,, | | 25 ,, | |
| 125 ,, | x | 75 ,, | | 21 ,, | |
| 115 ,, | x | 115 ,, | | 27 ,, | |
| 125 ,, | x | 115 ,, | | 27 ,, | |
| 125 ,, | x | 115 ,, | | 30 ,, | |
| 125 ,, | x | 125 ,, | | 31 ,, | |



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a Manpower Committee appointed last November by the industry's Consultative Committee reported that the lifting in January, 1950, of the Control of Engagement Order had accentuated the drift from the mines, and that during the first 44 weeks of 1950 the fall in the number of workers on colliery books from all causes had been 22,400 compared with a fall of 17,700 during the same period in 1949. Between 1948, when the post-war manpower reached its peak, and November, 1950, the industry's labour force had been reduced by 38,500. This loss was probably the major cause of the year's disappointing saleable output; but with a production of 216,300,000 tons the industry retained its record of uninterrupted expansion since 1947, although by only just over 1,000,000 tons; and it owed this gain to a higher rate of productivity, better attendance, and improved discipline. These improvements, however, did not prevent a failure by over 1,000,000 tons to achieve by October 31, 1950, a stocks target of 16,500,000 tons; hence the panicky November decisions to further reduce coal supplies for bunkers and bunker depots overseas, to purchase immediately up to 2,000,000 tons of foreign coal, and to intensify the restrictions on inland consumption. The supply position has since been largely retrieved by the decision of the miners generally, and not merely of a minority of them, to operate the 1947 additional hours agreement, and a recovery of 16,000 in manpower since mid-November, 1950.

The pithead price of coal remained unchanged at the 1949 level of 47s. 11d. till the end of the year, but as from January 1, 1951, it was raised by 4s. 2d. a ton to 52s. 1d. to cover the cost (*a*) of two recent wage revisions raising, *inter alia*, the national weekly minimum wage of underground workers to £6 7s. 0d., of surface workers to £5 10s. 0d., and the winding enginemen's national minimum shift rate to 25s.; (*b*) of the higher prices of stores and materials; (*c*) of the loss on imported coal; and (*d*) of the heavy decline of revenue due to reduced exports.

Some Continental countries protested against the dual price practice in the export trade and curtailed their purchases; owing to the autumn supply shortage others agreed to carry forward some of their requirements until the spring of 1951; and owing to inadequate coal unloading facilities at our ports U.S. Victory-type ships bringing American coals were diverted to Rotterdam and had their cargoes transferred to coasters for transit to specified points of consumption in Britain.

**N.C.B.'s Finances**

In the nine months ended September, 1950, the N.C.B's operational finances showed a surplus, after paying interest, of £7,600,000, but little if any surplus is expected from the December quarter accounts; in view, on the one hand, of a November wage award costing approximately £4,000,000 a year, and of other increased costs (including those on imported coals) and, on the other, of the loss of revenue from the export trade. There seems little likelihood, therefore, of the Board being able, on the strength of its 1950 trading results, to carry out its declared intention of wiping out the whole of the outstanding balance of the 1947 deficit of £23,000,000. Wages, however, have continued to advance; and now the average for all workers is over 182s. weekly (excluding allowances in kind).

# The Oil Industry

THE history of the international oil industry is full of broken production records—yet the magnitude of the increase achieved last year, so soon after the stupendous effort of the war years, must have surprised even those who have become accustomed to the almost yearly establishment of new records in the industry. Last year's crude oil output of 522,840,000 tonnes reached a new record and exceeded the 1949 figure by over 50,000,000 tonnes, or by roundly 11 per cent. A further increase in proved and indicated world oil reserves took place during the year, when the total rose to 80,700,000,000 bbl., against 80,182,000,000 bbl. at the beginning of the year. The outstanding development of the year under review was undoubtedly the fact that output in the Middle East surpassed that of the Caribbean area for the first time. One-third each of the increase in last year's output was accounted for by the Middle East and the United States, respectively; several other countries—including members of the British Commonwealth—reported new production records; the refinery construction programme was continued on a large scale, especially in this country and in Western Europe; the world's tanker fleet was increased further with special emphasis on the construction of giant vessels and, in the pipe-line sector of the industry, last year witnessed the completion of the Trans-Arabian pipe-line across 1,068 miles of mostly uninhabited desert to Sidon on the Mediterranean coast—an outstanding engineering achievement.

Analysing world oil production by major regions, North America produced in round figures 273,600,000 tonnes (255,825,000 in 1949), Latin America 102,500,000 tonnes (90,546,000), of which 85,900,000 tonnes (76,225,000) was in the Caribbean area; the Middle East 87,630,000 tonnes (71,188,000); the Far East 12,790,000 tonnes (10,345,000); Western Europe 2,000,000 tonnes (1,596,000); Eastern Europe, including the U.S.S.R., 44,320,000 tonnes (39,775,000).

### Higher U.S. Output

As regards developments in the more important individual producing countries of the world, the 1949 recession in the United States was followed by boom conditions in the spring of last year and the outbreak of the war in Korea brought about an increased demand for oil products. Although total output at 270,000,000 tonnes did not reach the 1948 record level, it represented a 7 per cent increase above the 1949 figure. It is important to note that the rate of output accelerated during the second half of the year, and particularly during the last quarter, when, according to estimates by the U.S. Bureau of Mines, it was equivalent to an annual rate of 322,000,000 tonnes. U.S. output amounted in fact to 51.6 per cent of the world total, and oil provides now about 40 per cent of the effective power used in the U.S. economy. Of the proved and indicated world oil reserves, the U.S. accounted for 28,400,000,000 bbl. or just over 35 per cent of the total.

Further development of the important oilfields discovered in Canada, particularly in Alberta Province, resulted in a 24.8 per cent increase from 2,829,000 tonnes in 1949 to 3,600,000 tonnes last year. Western Canada is at present one of the most active exploration areas in the world: over 150 companies are engaged in active exploration and development work in Alberta, Saskatchewan and Manitoba, with most of the field development concentrated in the Leduc-Woodbend and Redwater fields. Last year's output had to be held back on account of the lack of transport facilities, but the completion, towards the end of last year, of the "Fastest Inch" pipe-line from Central Alberta to Superior, Wis., U.S.A., over a distance of 1,127 miles, represents a major event in Canada's oil development.

Output in Venezuela, the world's second largest oil producing country, showed a marked increase by nearly 9,000,000 tonnes to 78,000,000 tonnes, and as regards other important Latin-American oil producers, there was an improvement in Colombia (4,800,000 against 4,163,000 tonnes) and Argentina's output reached a new peak of 3,500,000 tonnes (3,151,000 in 1949).

In Central America, Mexico has staged something like a "come-back" with an output, in 1950, of 10,600,000 tonnes (8,724,000), a figure higher than that for 1938. The number of rigs drilling in Mexico has shown an upward trend, with 70 rigs reported active in the latter part of last year, 55 of which were operated by Petroleos Mexicanos. Recently, attention has been focused on the Isthmus region just west of Yucatan Peninsula, with the drilling of a number of wells in the Tortuguero and Xicalango areas by the Mexican-American Independent Co. Trinidad's output remained practically unchanged at 3,100,000 (3,050,000) tonnes.

### Spectacular Accomplishments in Middle East

Total output of the eight Middle Eastern producers, namely—Persia, Saudi Arabia, Kuweit, Iraq, Egypt, Qatar, Bahrein and Turkey—aggregated 87,630,000 tonnes last year, as compared with 71,188,000 tonnes in 1949, an increase of 23 per cent. Last year, the Middle East contributed 32,900,000,000 bbl. to the world's proved and indicated oil reserves, equal to over 40 per cent of the total. Persia is still the leading Middle Eastern oil producer with a total of 31,800,000 tonnes (27,235,000), but Saudi Arabia is a close second with 27,000,000 tonnes (23,471,000), with production at the end of the year running at an annual rate of about 30,000,000 tonnes, a phenomenal development bearing in mind that output in 1944 amounted to 1,000,000 tonnes only. The Abqaiq field, now ranks as the world's largest producing field, having surpassed East Texas. Kuweit, where production started in 1946, is now the sixth largest oil-producing country in the world with a current output of about 20,000,000 tonnes per annum. Last year Kuweit produced 17,200,000 tonnes as compared with 12,378,000 in 1949. In fact, the development of the Burghan field by the Kuweit Oil Co. Ltd. since the war has been one of the most spectacular accomplishments in the industry, and this field is considered to be the largest single oil reservoir in the world. Iraq's output increased by 2,000,000 tonnes to 6,200,000 tonnes, as a result of a year's operation, at full capacity, of the new 16 in. pipe-line from Kirkuk to Tripoli. Qatar, where production started at the beginning of the year under review, achieved in the last quarter a production rate of nearly 2,000,000 tonnes. There was little change in Bahrein and Egypt, and only slow progress in Turkey.

### Increasing Exploratory Work in Africa

In Africa, considerable exploratory work was carried out during last year, particularly by the French Government, which is financing and encouraging exploration in France's extensive African territories. No spectacular results have so far been achieved, although the E.C.A. in Washington stated in May, 1950, in announcing its assistance in a $15,000,000 project to provide exploration and drilling equipment for the French development

programme in both Algeria and Morocco, that seven-ninths of Algeria's territory is "underlaid by potential oil-bearing strata." The Sinclair Petroleum Co. drilled a well to more than 10,000 ft. in Ethiopia before suspending it in April last. However, the company is continuing with its geophysical work. Preliminary exploratory work was under way last year both in Nyasaland and in Uganda.

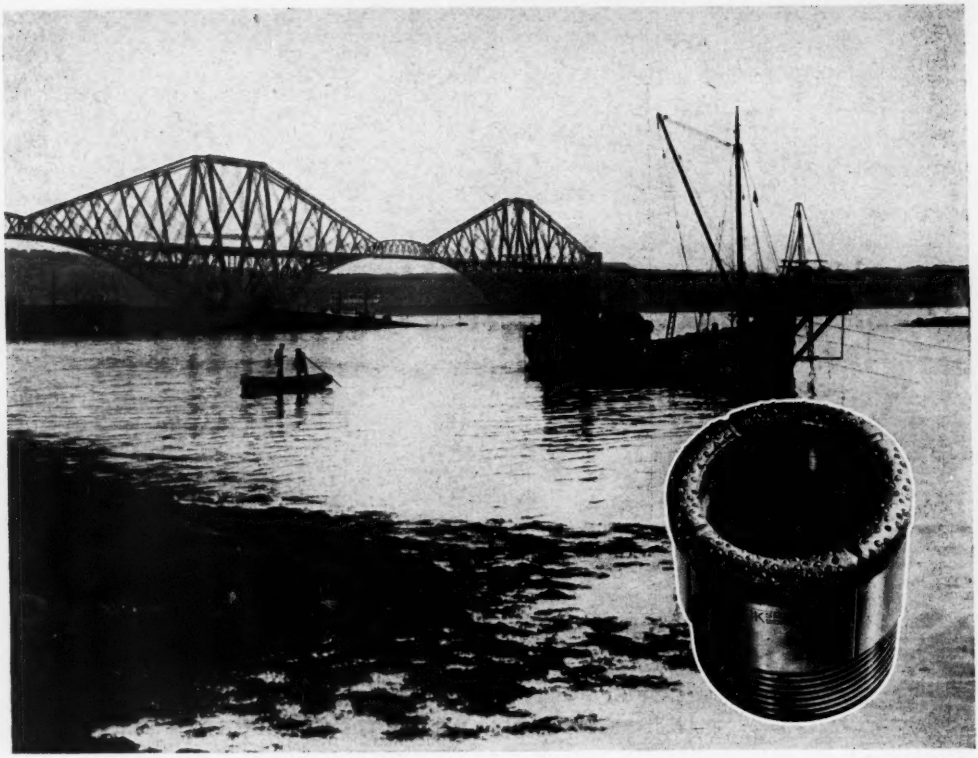
**Russia Exceeds Target**

It is officially reported that crude oil output in the Soviet Union, amounting to 37,600,000 tonnes last year, exceeded by about 2,200,000 tonnes the target of 35,400,000 tonnes, set for the last year of the first post-war Five Year Plan. As regards production in the satellite countries, what information there is indicates that production remained practically unchanged in Roumania—in spite of an intensified drilling effort—and in Austria, but small increases took place in both Hungary and Albania. Yugoslavia's efforts to step up her oil output were rewarded by an increase of 60,000 tonnes to 400,000 tonnes.

The most important development in the Far East was the recovery in the Republic of Indonesia, where the pre-war high of nearly 8,000,000 tonnes was almost re-established. Production in the foremost Commonwealth oil producer—British Borneo—continued to increase and amounted last year to 4,500,000 tonnes, as compared with 3,540,000 in the year before. However, this bright picture is marred by the sad decline of the formerly flourishing oil industry of Burma. In Japan, the discovery of a new producing zone in the Yabase field resulted in an increased output of roundly 300,000 tonnes (200,000).

In the world's leading oil producing country, the United States, new records were established in both completions and footage drilled in 1950. The 43,279 completions represent a gain of 4,241 wells, or 10.8 per cent above 1949, or 8.8 per cent higher than the previous record year, 1948. Total footage drilled amounted to roundly 159,288,000, or 15.4 per cent over the previous high established in 1949. Last year, all previous records for wildcatting were broken: 8,554 exploratory tests were completed, (+17.3 per cent) with a total of roundly 34,152,000 ft. drilled. Texas led the country with 16,585 completions (*i.e.* 38 per cent of all the wells drilled); followed by Oklahoma, Kansas and Illinois (in this order). The steady increase in the average depth per well drilled continued: average footage for 1950 jumped to 3,680 ft., as compared with 3,538 ft. for the preceding year. The upward trend in imports, which has been evident for several years, continued during 1950, imports aggregating 844,000 bbl. per day, equal to about 12.5 per cent of total demand. Refinery operations, following the general upward trend in demand for petroleum products, reached a new all-time high in 1950. Crude runs to stills averaged 5,728,000 bbl. daily, representing increases of 7.5 per cent over 1949 and of 3.2 per cent over the previous record established in 1948. Another U.S. record broken is that for pipe-line constructions: projects of a total length of 16,000 miles were completed; of this figure, 10,623 miles were accounted for by natural-gas pipe-lines; crude oil pipe-lines completed totalled 3,214 miles, and the unusually high figure of 2,444 miles was reached for product line completions.

The number of operating refineries throughout the world (excluding the Soviet Union and her satellites) totalled 604, with a crude oil capacity of 10,590,285 bbl. daily and a cracking capacity of 4,929,885 bbl. daily. Of this total, 364 were in the U.S. with a crude oil capacity of 4,050,020 bbl. daily and a cracking capacity of 1,221,980 bbl. daily.



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# The Diamond Industry

***By a Special Correspondent***

WHEN surveying the diamond industry it is always useful to refer first of all to the diamond sales of De Beers Consolidated Mines, as they represent about 95 per cent of the rough material supplied to both gem diamond polishers and diamond tool and wheel producers.

In 1950 the total sales by the Diamond Trading Co. Ltd. were £38,400,000 for gem diamonds and by Industrial Distributors (1946) Ltd. were £12,600,000 for industrial diamonds. Table I gives the sales for the year 1950, which show that with the exception of the 2nd quarter the gem sales per quarter were around the £10,000,000 mark, whereas the industrials showed a sharp increase for the last quarter. This was unexpected and was responsible for the fact that the total sales exceeded £50,000,000.

**Table I. Sales of De Beers Group in 1950.**

| | Gems £ | Industrials £ |
|---|---|---|
| 1st quarter..... | 10,486,078 | ..... 2,114,107 |
| 2nd quarter ..... | 6,744,765 | ... 2,471,333 |
| 3rd quarter ..... | 10,758,265 | ..... 2,528,428 |
| 4th quarter ..... | 10,368,590 | ..... 5,495,475 |
| | 38,357,698 | 12,609,343 |

The aggregate sales for the last seven years show that no clear relationship exists between the sales of gem and industrial stones (Table II). There is, however, undoubtedly a tendency for the industrial sector to increase, the turnover having risen during last year to 330 per cent over the 1944 figure. This latter represents the somewhat exaggerated demands of the war years (requirements of the U.S.A. and Russia). There is no doubt, that the high level of industrial diamond production will be maintained; it remains to be seen whether production can be further increased and if not whether the additional demands for the rearmament programmes can be met from available supplies.

**Table II. Aggregate sales of De Beers Groups for the last seven years.**

| | A. Gems (£000,000) | B. Industrials (£000,000) | Ratio (B/A %) | Total (A.+ B.) (£000,000) |
|---|---|---|---|---|
| 1944 ..... | 13.2 | 3.8 | 29.0 | 17.0 |
| 1945 ..... | 21.0 | 3.5 | 16.6 | 24.5 |
| 1946 ..... | 26.1 | 3.5 | 13.3 | 29.6 |
| 1947 ..... | 20.1 | 4.4 | 21.8 | 24.5 |
| 1948 ..... | 26.8 | 11.3 | 42.3 | 38.1 |
| 1949 ..... | 19.9 | 8.5 | 42.7 | 28.4 |
| 1950 ..... | 38.3 | 12.6 | 33.0 | 50.9 |

Trade circles now realize that there is no truth in the belief that the diamond producers are stockpiling. The plain fact is that diamond imports must come from current production and that the increased supply of rough stones failed to keep pace with consumer demands for gem diamonds. At the same time it is hard to reconcile this state of affairs with the news that reaches us of unemployment and wage disputes in the gem polishing centres, and it is difficult to escape the conclusion that an appreciable part of the rough diamonds sold are being hoarded. It may well be impossible to put a stop to this as was done immediately after the war in Holland, and is still done successfully in Israel, but an enquiry into this matter would undoubtedly be of benefit.

**Production by Countries**

*Angola*: The first five months of 1950 yielded 212,925 ct. diamonds, compared with a total production of 769,404 ct. in 1949, and of 794,200 ct. in 1948, from which it can be concluded, that the production is fairly constant. Some improvements in mechanization are reported, such as reconcentration pans for concentrates of normal specific gravity, and for high specific gravity concentrates. This process is considered more economical and expected to give better protection against diamond thefts.

*Belgian Congo*: Complete figures for 1950 are not available. The value of the exports for the first five months of 1950 was 161,944,120 Belgian francs for industrials, and 43,387,124 for gem diamonds, which suggest a 15 per cent increase. Another source gives the customs value of diamonds exported from the Belgian Congo and Ruanda-Urundi as 253,371,066 francs for the first six months, 1950. A U.S. Bureau of Mines report summarizes the main features of the Bakwanga diamond field which has an average diamond content of 5 to 6 ct. per cubic metre.[1] J. Lepersonne described the geology of Western Kasai and demonstrated the connection between the origin of diamonds found in this area and of the composition of the Karroo System.[2]

*Brazil*: New information on Brazilian alluvial diamond fields and diamond mining was given by T. Draper.[3] Brazil has 14 diamondiferous regions, the stones differing in size, shape, colour and quality in each region. Bahia field, discovered in 1941, is the world's only producer of carbonados in commerical quantities. Brazilian production of diamonds consists of 30 per cent gems, 30 per cent industrials and 40 per cent inferiors.

*French West Africa*: The total production from opencast deposits between 1934 to 1947 amounted to 656,700 ct. The diamondiferous zone exhibits the same characteristics as those in Sefadu, Sierra Leone.[4] Diamonds are reported to have been found near Dimbokro, Birrimian Massiv, Central Province.[5] Diamonds produced in 1949 amounted to 94,996 ct. and exports to 84,963 ct.

*French East Africa*: During the first nine months of 1949 diamond exports were 110,000 ct. valued at Fcs.260,000,000 (Fcs.2,365 per ct.).[6] Diamonds are the only commodity in French Equatorial Africa subject to a levy of export royalties; a duty of 6 per cent having been made payable under a decree dated December 28, 1949. The E.C.A. is to grant a $400,000 loan to promote diamond prospecting with a view to increasing U.S. diamond stocks.

*Gold Coast*: The haphazard methods of the rapidly growing native diamond mining industry have been described by M. N. Hennessy. Production from mining companies reached 534,000 ct. in 1949, while native production is said to have reached 500,000 ct. (see below) and is expected to exceed company production in 1950. Diamond exports in 1950 totalled 914,496 ct. (value £1,334,528) of which 40 per cent came from native production.[7] [8] Peak production of 2,000,000 ct. occurred in 1934, and obviously production has since then declined considerably.[9] An important diamond field between the Tarkwa and Abosso gold mining districts, about 50 miles inland from Takoradi has been discovered and large numbers of native prospectors have flocked into the area. In the year ending March 31, 1950, the native industry exported 451,602 ct. valued at £762,122 compared with 281,799 ct. in the previous year; prices also show considerable advances.

*The Guianas*: Although diamonds are worked both in British Guiana and Venezuela, in French Guiana diamonds have not hitherto been discovered despite some mistaken information to the contrary. A recent Government report[10] indicates extensive diamondiferous deposits in Kurupung and Meamu areas. It remains to be seen whether the diamond finds will be sufficiently extensive to justify any degree of mine mechanization. Mean-

while, sampling is in progress in the Eping, Kurupung and Meamu areas. The diamond production of the Aurora fields worked in the vicinity of Dukwari Fall and at Shinese Londing are described,[11] but no statistical data are available. These were first worked in 1908 or 1909, but there was a revival of activity in 1947. The diamond exports for 1950 were 19,947 ct. of a value of $745,643 compared with 21,459 ct. in 1949 valued at $701,126.[12]

In Dutch Guiana only about 100 diamonds have been found hitherto, there has been no rich strike.[13]

*India*: A diamond-bearing volcanic pipe has been discovered near Panna Town, Central India, according to the Geological Mining and Meteorological Society of India. The surface exposure of the diamond pipe, which is of oval outline, covers 150,000 to 200,000 sq. ft.[14] [15] The diamond content averages 1 ct. per 4 tons of rock which is comparable to that in Kimberley Mines. Diamonds are of high quality and up to 40 to 50 ct. in weight. Deposits are reported to be commercially quite workable.

*Kenya*: A diamond rush has been reported from East Africa; licences to prospect have been granted. For several months the wild, sparsely inhabitated, gamefilled plains have been investigated and official diamond valuers will be appointed.[16]

*Sierra Leone*: It is felt that the future economic progress of Sierra Leone may depend primarily on further mineral expansion and therefore larger funds have been made available for geological surveys.[17] Diamond production for the second quarter of 1950 was 253,947 ct., compared with 114,848 ct. for the same period of 1949; this seems to indicate a big increase in production.

*South Africa*: Great endeavours are being made to increase diamond production by improving the rate of recovery. At the Premier Mine a heavy media separation plant with a working capacity of 400,000 carloads per month has been installed, with ferro-silica as a separation media which raises the gravel-water mixture to a specific gravity of about 2.9, compared with 1.8 formerly.

Linari-Linholm at the Diamond Research Laboratory, Johannesburg, has developed an electrostatic separation plant, which is now being installed in several mines for dealing with stones which do not adhere to grease tables.[18]

The diamond producing industry is demanding the removal of the war-time Diamond Mines Special Contribution which is still being exacted by the South African Government.

It is reported that diamonds, mostly green, are sometimes found in the gold mines.[19]

The new Jagersfontein diamond mine, completely re-equipped with modern machinery, giving employment to 350 Europeans and 2,000 natives has been re-opened.[20] The diamonds are mostly pure white, sometimes sapphire blue; in 1893 the "Excelsior" diamond of 971¾ ct. was found here.

The South African diamond industry almost doubled the value of its purchases in 1949, this being mainly due to the re-opening of New Jagersfontein and Premier Mines.[21] [22]

The Union Government, which owns diamond fields now closed, has agreed not to open new fields without prior consultation. Part of the farm Nooitgedacht belonging to De Beers was proclaimed as an alluvial diamond digging during 1949; at the wish of the Minister of Mines a further 250 morgen have been thrown open since the beginning of 1950.[23] The South African Government imposes a 10 per cent export duty on diamonds.[24]

*Tanganyika*: Newspaper reports indicate that Dr. J. T. Williamson is not satisfied with his present sales agreement with the Diamond Corporation. He is asking for a greater percentage of the quota handled by Diamond Corporation (his share is at present 10 per cent), or for an upward revision of pricing, or both.[25] New treatment plant is just coming into operation, which includes heavy media separators of a capacity of 2.5 tons per hour.[26]

The total exports for 1950[27] amount only to 70,603 ct. valued at £746,067 (212s. per ct.) compared with a revenue of £1,695,706 in 1949. The average value per ct. is very high, indicating that practically the whole output consists of gem diamonds. This rate of export does not correspond to the possible production rate which may be up to 1,500,000 ct. per year. Other reports quote a production rate of about 450 ct. per day, while the above export figures indicate only 232 ct. per working day. It is hoped to increase production tenfold, when the actual diamond pipe is tapped.[28]

The Tanganyika Legislative Council passed a bill to increase control over diamond producers and to discourage illicit diamond trading. No vehicle or aircraft is permitted within five miles of the diamond mine except under police supervision.[29]

*Venezuela*: The diamond deposits of Venezuelan Guayana have been described by J. C. Davey[30] who gives a detailed discussion of the five main diamond fields. Commercially exploitable diamond deposits are frequently found near headwaters of streams, whose source is close to scraps of Koraima formation. Some North American companies are interested in the district; and thorough sampling of selected areas is being carried out.

According to information from the United States rich diamond deposits have been discovered in the Uriman region of Venezuela's South East province of Bolivar. Diamond diggers, especially from the nomadic diamond-mining population of the Icabaru district, were ordered to leave the Uriman region as this is part of the governmentally controlled diamond-mining area. 15,000 ct. were collected in about six weeks operation; the ratio of gem to industrial stones being 60 per cent to 40 per cent.[31]

**Diamond Trade**

R. M. Shipley has recently reviewed the activities of the so called Diamond Syndicate. The principal organizations controlling the diamond market at present are: (a) De Beers and the Diamond Producers Association; (b) the Diamond Corporation; (c) the Diamond Trading Co. Ltd.; (d) Industrial Distributors.[32] With the exception of the important Brazilian production of gem and industrial diamonds and of Venezuela and the Guianas and the less important production of French West Africa (all of which areas have an aggregate annual output of around 500,000 ct.) this combine has a world monopoly.

The Diamond Producers Association agreement covering diamond sales has been extended for six years from January 1, 1950.[33] [34] Under a new arrangement a £2,500,000 Diamond Purchasing and Trading Co. has been formed and has entered into agreement with the Diamond Producers Association for sale of gem diamonds.

*Israel*: During the six months January to June, 1950, diamonds to the value of £I.1,283,638 were exported compared with £I.774,251 in 1949, showing an increase of about 66 per cent. The Diamond Trading Co. allocated to Israel during October, 1950, rough diamonds valued at £I.225,000.

*U.S.A.*: Diamond imports to the U.S. rose from $2,900,000 in 1938 to $77,900,000 ten years later. Imports to U.S. from the sterling area rose to 76 per cent above pre-war volume.[35] In the spring of 1950 James Boyd, Director of the U.S. Bureau of Mines, declared that the U.S. had a long way to go before its stockpiling programmes were completed and in the case of industrial diamonds he stated that stockpiling was essential. No research is said to be under way on diamond synthesis in the U.S. and therefore the country is largely dependent on African sources. Consequently some of the most vigorous and successful efforts in the stockpiling pro-

gramme have been directed toward diamond purchasing.[36]

The E.C.A. has announced purchase of strategic materials amounting to $61,000,000 since its programme began, including industrial diamonds to the value of $5,300,000. President Truman requested Congress last year to appropriate another $600,000,000 for stockpiling purchases of strategic materials. It is understood, that this appropriation includes further provision for industrial diamonds.[37]

During the first six months, 1950, the U.S. imported 262,000 ct. of polished diamonds valued at $30,796,000 and 475,600 ct. rough diamonds for gem polishing valued at $23,674,000. Compared with the 1949 values this is an increase both in quantities and values of about 13 per cent.

**Diamond Polishing**

*General*: At a recent conference of the Association Internationale du Diamant at Amsterdam new efforts were made to create uniform working conditions in all diamond working centres. A proposal was made for a 40-hour week the outcome of which was unknown at the time of writing. A further boycott of the German diamond polishing industry has been agreed upon on the grounds that this is still considered a war industry.[38]

*Belgium*: Statistics show, that the number of employees in the Belgian diamond industry is declining; figures are about 25,000 in 1940, 17,000 in 1946, and not more than 9,000 to-day. The reduction in numbers employed and hence in output is shown by the amount of polished diamonds imported to U.S. In 1937-1939, 75-84 per cent came from Belgium; in 1949 only 47 per cent.[39] There was, however, a slight improvement in 1950. Belgian exports to the U.S. in 1950 were 214 per cent higher, than those in 1949, whereas South Africa has increased its exports to U.S. by 241 per cent. The number of unemployed dropped from 4,500 to 3,200.

In the first six months of 1950, Belgium exported 195,003 ct. of polished diamonds, which is the highest post-war figure. Average price in June, 1950, was £35 per ct., against £45 in 1946.[40] The industry is on a 40-hour week. Employers have recently agreed to a 10 per cent wage increase.[41]

*Germany*: Representatives of the British, Belgian, Dutch, American and Israeli diamond polishing industries have decided to boycott the German diamond polishing industry, because of its alleged dumping policy (see above). No member of the International Diamond Manufacturers Association will send any rough diamonds to Germany to be polished or purchase any polished diamonds from Germany. In spite of all these measures, the German diamond polishing industry seems to flourish. It is gradually coming to be realized outside Germany, that it is not possible to suppress this industry entirely and that dumping can only be avoided by agreement on wages, supply of raw material, etc.

*Holland*: The low level of employment in the diamond polishing industry is due to higher wages than those being paid in Belgium and Germany. Polishing of small stones is now done almost entirely in these countries, while that of larger stones is no longer remunerative owing to South Africa's 10 per cent export duty. This work is now being carried on in South Africa or the U.S.A. Contact is said to have been made with German industry to raise the level of its wages.[42]

The Benelux economic group will discuss unification of wage rates and conditions of employment.

*Israel*: Imports of raw material and exports of polished diamonds are under close Government supervision. Rough material is only supplied to owners of factories. Rough supplies are about £1,200,000 per month consisting of 80 per cent melee and 20 per cent chips. 1,800 workers are now employed, compared with 500 workers and apprentices previously; no apprentices being taken at the moment. With more regular supplies the number of workers may be raised to between 2,000 and 2,500; about 75 per cent work on privately owned plants. Strict control of the supply of rough diamonds is in operation; diamond polishers being compelled to produce £I.400 worth of polished stones from every £I.100 of roughs.[43]

*South Africa*: Since April 3, 1950, all exports of South African rough or cut diamonds (other than to Britain) have to be paid for in U.S. dollars. The purpose of this regulation is to avoid loss of dollars through the use of so-called "cheap" sterling to purchase diamonds for immediate resale to U.S.

Shipments of polished diamonds to approved sterling area countries can only be made if diamonds to a corresponding value are shipped to hard currency areas.[44]

**Industrial Diamonds**

The Diamond Tool Industry, which even 10 years ago could be considered as of minor importance, is now growing very much faster as its products are being developed more scientifically and on a better engineering basis.

*England*: The first *Industrial Diamond Trade Name Index* made its appearance containing some 1,200 names about a year ago, and it is understood that a second edition will be available towards the middle of the year. A bibliographical service has been organized by the Industrial Diamond Bureau together with the Industrial Diamond Review.

The Secretary of Overseas Trade in a written answer on June 13, stated that industrial diamonds and dies could not be exported to a number of countries including the U.S.S.R., without an export licence; applications are being considered on merit. Exports to Western Europe are free from this control, except where goods are ultimately intended for one of the controlled destinations.[45]

*U.S.S.R.*: Extraordinarily high sales are reported to have taken place from Switzerland to Russia and Eastern European States. In a trade agreement between Russia and Belgium there is reference to an unspecified amount of industrial diamonds.

According to a Belgian source[46] the Soviet Union stopped purchasing industrial diamonds towards the end of 1949, having obtained 8,000 to 9,000 ct. during the year. During the first three months of 1950 practically no diamonds were bought.

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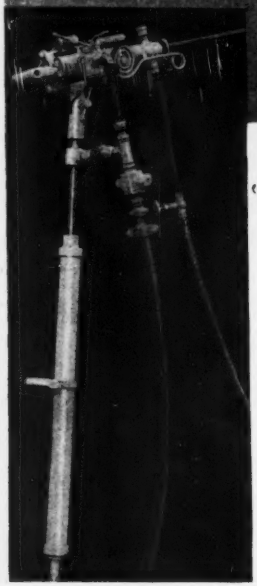

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# Review of Geochemistry

IN geochemical prospecting for ore deposits, the determination of the age of rocks is of considerable importance. In connection with the geochemical method described by Miholic[1] it is necessary to determine the age of igneous rocks accompanying metalliferous faults and joints. Up to now, radioactive methods are the only ones available but these have not been considered very suitable for igneous rocks owing to the various sources of error which are difficult to correct. The methods in common usage are the "helium" and "lead" methods first proposed by Strutt (1908) and Boltwood (1907) and the "strontium" method proposed by Hahan and Walling (1938) which is based on the disintegration of the rubidium isotope $^{87}Rb$ into the inactive strontium isotope $^{87}Sr$. A number of granites and schists have recently been examined by Miholic[2] using both the lead and strontium methods and, with some exceptions, the methods have been found to give very fair agreement. As a result of this work, new light has been shed on the age determinations of a number of igneous rocks and further work may well solve some more vexed questions.

The study of uranium and its associated elements is likely to be of considerable importance for many years to come in connection with its potential use for the development of atomic power if not from a more lethal aspect. Recently a symposium on uranium was held in Canada[3]. The papers read at the symposium dealt with many aspects of uranium mining. The various deposits occurring in Canada were tabulated and details were given on fracture systems in the pitchblende deposits in Saskatchewan. Radiation detectors for prospecting were detailed and the possibilities of gravity concentration discussed. Papers given at the symposium also dealt with the radiogenic concentration of uranium ores.

### Report on Jamaica

The geology and mineral resources of Jamaica have been described in some detail by H. R. Hose[4]. There are considerable surface deposits of bauxite amounting to some 200-315 million tons but it is of a low grade, most probably unsuitable for the production of aluminium although suitable for mortar and cement. There are deposits of copper sulphide and carbonate, the copper ore from the Charing Cross Mine showing a copper content of between 8 and 24 per cent. There are considerable phosphate cave deposits consisting of three guano layers and a thin layer of phosphate rock, as well as some millions of tons of surface gypsum deposits. There are also extensive limestone deposits together with small deposits of barite, iron, manganese, cobalt and radioactive minerals.

The geology of the Kirkland Lake gold mines in Canada has been described by J. E. Thomson *et al*[5]. In the Macassa mine the gold occurs in quartz-filled fractures in augite syenite, the ore running at 0.439 oz. per ton with the reserves estimated at 413,650 tons. In the Kirkland Lake gold mine the ore occurs in quartz veins in syenite, the ore running at 1 oz. per ton with reserves estimated at 331,540 tons. In the Teck-Hughes mine the gold again occurs in quartz veins yielding 0.3 oz. per ton, the reserves being estimated at 263,939 tons. The Toburn mine and the Wright-Hargreaves mine average 0.5 oz. and 0.4 oz. per ton, the ore reserves being 68,000 and 920,000 tons respectively. The largest producer is the Lake Shore mine, the gold for which averages 0.523 oz. per ton.

The mineral resources of Columbia have been comprehensively surveyed by Q. D. Singewald[6]. The principal minerals which are exported are emeralds and gold, platinum and silver ores. Other mining products, principally for home consumption, include coal, the reserves of which are estimated at $10^{10}$ tons, clay, gypsum and salt, together with smaller amounts of iron, copper, chromium, molybdenum and manganese.

A detailed account of Nyasaland's resources has been given by W. G. G. Cooper[7]. The country contains deposits of asbestos, bauxite, sub-bituminous coal, gold, graphite, iron ore, mica, galena, monazite and rutile, amongst others. The composition of the bauxite is given as $Al_2O_3$ 42.73 per cent, $Fe_2O_3$ 13.93 per cent, $TiO_2$ 1.57 per cent, $SiO_2$ 15.65 per cent.

### Iron Ore in Brazil

A survey of the iron ore deposits in Brazil has been given by J. Van Door[8]. The author deals with the deposits of the Central Minas Geraes which, he states, contain rather less than 200 million tons of high-grade ore. There appears, however, to be a general lack of information about the deposits, and transportation constitutes a major difficulty. The magnesite deposits of Central Ceará, in Brazil, have been described by A. J. Bodenlos[9]. These deposits, which constitute one of the major reserves of high-grade magnesite in the western hemisphere, are estimated at nearly 2,000,000 tons. The area consists of metamorphosed pre-Cambrian rocks overlain with dolomites, limestones, phyllites and quartzites. The magnesite has been formed by the replacement of the limestone calcium with magnesium and can be surface mined.

New black sand deposits on the Vizagapatam coast have been described by C. Mahadevan and B. N. Rao[10] and consist of layers between one in. and eight in. thick, located between Dibbalapalem and Bhimilipatam. The average composition of these sands is garnet 15 per cent, ilmenite 5.5 per cent, magnetite 36 per cent, monazite 3 per cent and zircon 0.6 per cent, although some of the deposits are very much richer in ilmenite and monazite. The ore reserves to a depth of five ft. are estimated at 12,500 tons of garnet, 5,700 tons of ilmenite, 37,000 tons of magnetite, 3,100 tons of monazite and 550 tons of zircon.

### Work of the U.S. Bureau of Mines

As is usual, a considerable number of papers have been published during the year by the United States Bureau of Mines, and a selection of a few of these is given below.

The Cove Meadow copper deposit, Humbolt County, Nevada, is dealt with by R. R. Trengrove[11]. The deposit consists of massive andesite in contact with granodionite and holes drilled in the sheer zone of the andesite gave samples having up to 6.75 per cent copper and 4.60 oz. of silver per ton. A paper by J. W. Cole[12], describes the Sunrise copper-gold mine, Granite County, Montana. The samples from eight drill holes showed the maximum amount of copper to be 1.4, of lead 0.13, of tungstic oxide 0.13, of gold 0.12 and of silver 1.43 oz. per ton.

The Furniss tungsten deposits, Cabarrus County, N.C., form the subject of a paper by Jones and Peyton[13]. These are in the form of lenticular quartz veins, the chief minerals of which are chalcopyrite, scheelite and native gold. Analysis indicates the following average figures, tungstic oxide 7.7-19.6 per cent, gold 0.08-0.18 oz. per ton and silver 0.20-0.38 oz. per ton.

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# Mining Trends in 1950

By J. S. SHEPPARD, O.B.E., B.Sc., A.R.S.M.

THE high price of most metals in 1950 and the realization that world-wide stockpiling and rearmament would indefinitely postpone the slump that had been expected in the wake of the post-war boom, encouraged many mining companies to increase production and intensify the search for new mineral deposits. This increased activity was not, however, to be found in every country, for such favourable conditions for expansion were often offset by the realization that increased production would be profitless in the face of excessive taxation of both the company and the individual shareholder. Exploration was at times curtailed for the same reason.

The search for fresh deposits of economic minerals becomes yearly more difficult and in most cases more expensive. The majority of ore bodies that reveal their presence to the casual prospector by outcropping or giving some surface indication of their location have already been discovered and although geological mapping and surface prospecting still continue, most modern exploration must necessarily be based on geophysical and geochemical examinations, followed by diamond drilling if the initial survey is sufficiently encouraging.

**A 50 ton armoured Diesel truck for use in open pit mining**

*(Courtesy of The Heil Co.)*

The aeroplane is frequently used in large-scale exploration, not merely as a means of rapid transport, but as a carrier of sensitive geophysical instruments and air cameras. It is now customary to take vertical air photographs of any area that is being searched and a geologist trained in the science of photogeology is often able to indicate the locations that justify the closest inspection. On rare occasions, mineral deposits can be directly identified from the photos. Large bodies of high grade iron-ore have recently been found in South America as a result of air-photo examination.

Airborne geophysical surveys have until recently been confined to measurements of the strength of the magnetic field but an airborne electrical survey method has now been developed and used in Canada. Geophysicists also predict that it will soon be possible to undertake gravity surveys from the air, although the layman will find it difficult to believe that the slight variations in the earth's gravitational field can be detected by an instrument that is subject at the same time to the fluctuating forces induced by the aeroplane's flight.

The search for uranium can now be conducted from the air by employing a super-sensitive Geiger counter that is carefully shielded from cosmic radiation. The U.S. Geological Survey has been largely responsible for the development of this equipment which can also apply continuous atmospheric tests for the presence of radioactive radon gas that escapes from uranium ore bodies.

The diamond drill is still the best positive means of delineating a subsurface ore body but the high cost of drilling makes it essential that every hole should yield the maximum possible information. A geochemical analysis of the core for trace elements can at times indicate the presence of a nearby ore body which the hole had failed to intersect. Tests in Canada have revealed that geophysical measurements can be made within a drill hole and it should not be difficult to design suitable instruments for this task. Where extensions to existing ore bodies are being sought such measurements would probably eliminate much fruitless drilling.

### Open Pit Mining

The principal trends in open pit mining have been to employ motor trucks in the place of tracked haulage and to replace existing power shovels and other machines by similar models of greatly increased capacity. The use of power shovels in conjunction with armoured Diesel lorries appears to provide the most efficient mining methods in many varying circumstances. A Canadian mine that recently changed from electric to truck haulage achieved reductions of 50 per cent in transport costs and 40 per cent in loading costs. Further economies can frequently be achieved by increasing the size of the component machines. A four cubic yard shovel can replace a pair of two cubic yard shovels with a resultant saving in labour and maintenance costs; but such a change can only be made where the flexibility of truck loading ensures that the larger shovel can work at its full rate of output. In Pennsylvania, opencast coal mines now operate end-tipping Diesel trucks with a carrying capacity of 50 tons.

A method of drilling small blast holes by blowpipe is being applied in some American quarries. The high velocity flame from the blowpipe, which has a temperature approaching 4,000 degrees Fahrenheit, can bore holes up to 10 ft. in depth at a rate of 50 ft. per hour. Hard rocks with high melting points, such as quartzites, are most suited to this method and it is expected that some low-grade and very hard iron ore deposits that have hitherto been economically unworkable may now be exploited successfully with the aid of this new and novel tool. It is doubtful whether the blowpipe could be applied in underground mining as the elimination or disposal of dangerous fumes would be difficult.

Shaped charges are being used to an increased extent in open pit mining for breaking boulders that are too big for the crusher. A new type of charge that has recently been put on the market can be placed on top

of the boulder without any cover and is capable of splitting a twenty ton rock. The scattering of fragments is so small that is unnecessary to move power shovels and other equipment when firing.

**Underground Development**

Growing wage bills, coupled with local labour shortages have caused many mining companies to review existing practices in mining and development: increased mechanization has been the obvious solution in many cases. Labour often accounts for 60 per cent of the cost of mining and when the introduction of machines can reduce manpower requirements, or increase the output per man-shift, the changeover is almost invariably justified whatever the initial capital expense.

Most operations in the development of a mine are now fully mechanized although the major operation of shaft sinking still presents some problems. The confined space and the need for tall sinking skips or buckets make mechanical mucking extremely difficult. If the shaft is rectangular, there may be sufficient room to employ a scraper to load into the skip via a ramp, but where a circular shaft is to be sunk some other means must be sought. An American mine has developed a clam-shell grab for the purpose, which, being operated from a point well above the skip, can effectively clean-out even small diameter shafts.

Post-war practice in driving development headings incorporates the use of drill carriages, carbide alloy bits and mechanical mucking. The modern drill carriage, or jumbo, frequently carries not only the drills but much auxiliary equipment in the form of ventilation fans, electric light, and a drill mounted at the rear of the carriage for drilling trimming and pin holes. It has been found that progress can be increased in most cases if the drills are mounted on hydraulically-operated jibs. This method of mounting is especially effective if the carriage is to be employed not only for drifting but also for stoping. Some mines that are working flat bedded deposits now do all their drilling with the aid of such machines.

The introduction of tungsten carbide bits has increased drilling speeds considerably and reduced the time lost in changing steels, for it is now possible to drill the 10 or 11 ft. holes that are customary in main development headings with only one, or, at most, two changes of steel. This has, in turn, necessitated the introduction of drill shells 5 or 6 ft. in length. To avoid undue weight these long drill shells are usually made of aluminium alloy.

Many mines now employ the burn cut in development heading especially if the rock is tough. Millisecond delay electric detonators are also becoming increasingly popular. The higher cost of this type of detonator is far outweighed by the improved fragmentation obtained and the reduced danger of cut-offs. The round can usually be broken with a smaller charge or a reduction in holes drilled and the resultant muck pile is less scattered and more amenable to mechanical loading.

A carefully planned cycle of operations is necessary if a high rate of progress is to be attained in drifting. Before the advent of drill carriages, tungsten carbide bits and modern mucking machines, the engineer was usually satisfied if he could acnieve one complete cycle per shift even with the help of scraper loading. This can now be bettered and remarkable daily footages have been recorded, especially in hydro-electric schemes where every incentive to rapid progress is offered. Last year, in California, a 12½ ft. tunnel being driven for the Owens River Gorge project advanced at an average rate

of 75 ft. per day for several months. During one period, 253 rounds were fired in 31 working days with an average pull of 9 ft. per round. Even assuming that conditions were very favourable the maximum advance of 104 ft. in 24 hours is very impressive.

**Mining Methods**

Although no major innovations in methods of mining were introduced during 1950, many mining companies increased their degree of mechanization. Several mines working massive deposits changed their methods to some type of block caving. Careful planning and a precise knowledge of the relative strengths of ore and country rock are required before block caving can be employed with success. Inaccurate assessment of any of the major factors involved may result either in excessive dilution or in inadequate breaking and a low recovery. Several Canadian asbestos mines are now following the lead of the Thetford asbestos mines where some 20,000,000 tons of ore have now been mined by block caving.

Sub-level stoping using long blast holes also gained in popularity. Such a method, using diamond drill holes up to 70 ft. in length, can be applied in many differing circumstances and always yields a high tonnage per manshift. In 1946, when the use of long blast holes first became popular it was confidently forecast that every succeeding year would see a large increase in the number of diamond drills in use underground, but although an increase has certainly occurred the inflated price of industrial diamonds has damped the enthusiasm of many companies. Some mines, not wishing to lose the undoubted advantages of long holes, have turned to percussion drills with carbide alloy bits and jointed rods. Such machines are adequate for the task but the resulting holes lack the smoothness and regularity of the diamond-cut holes and charging them with explosive may be difficult and even dangerous. If the ground is fractured or fissured it is often difficult to charge even diamond drill holes and a pneumatic loader recently developed by the Atlas Powder Co. will be welcomed by all engineers faced with this problem. With this loader, tamping is by means of a metal-cored rubber hose that can be advanced and retracted rapidly in the hole by an air motor. Holes up to 85 ft. in depth can be charged.

**A large mechanical loader at work underground**

*( Courtesy of Eimco Corpn.)*

In orthodox stopes many American and Canadian mines have recently introduced air-legs mounting light machines, requiring only one operator, in place of heavier bar-mounted machines. This is one of the rare cases when European practice has been in advance of American, for such a drilling rig has been standard in many European mines for some years.

The last two years have seen the complete mechanization of all coal-face operations in many mines throughout the world. Although an increase in mechanization was to be expected the change has been accelerated in many European countries by the Economic Co-operation Administration which has enabled these countries to purchase American equipment.

**Coal Mining**

A number of continuous mining machines have been evolved, capable of breaking and loading the coal in a single operation. In America and Canada, where room and pillar mining methods are generally practised, continuous miners made by the Joy Manufacturing Co. and manned by a crew of 4 or 6, are yielding 200-400 tons per shift depending upon the seam thickness.

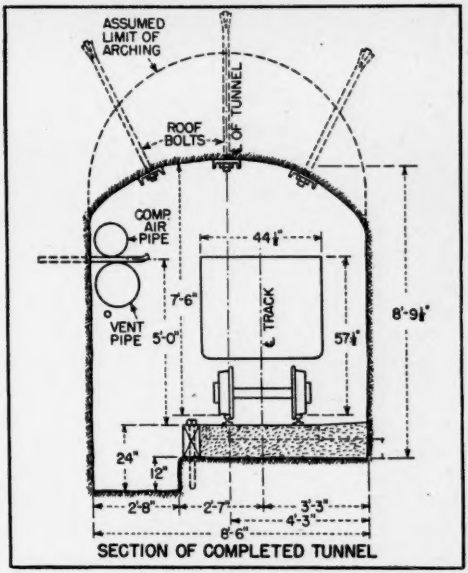
There has been a marked trend in America towards trackless mining. The flat and regular seams that are exploited in the U.S.A. are ideally suited to this type of mining and cutters, loaders and shuttle cars mounted on large pneumatic tyres have boosted output at many mines. The development of trackless mining has been greatly assisted by the widespread introduction of roof bolting in coal mines. This system of roof support eliminates props from the working place and gives the trackless machines complete freedom of movement. A similar mining method is now being practised in some metalliferous mines working bedded deposits. In such cases, blast holes are drilled by machines mounted on rubber-tyred pneumatic jumbos and haulage is by Diesel or electric shuttle car. Where the headroom is sufficient, open-pit Diesel trucks are employed in conjunction with large mechanical loaders or small power shovels.

Most coal mines in Great Britain, being worked by the longwall system, cannot be mechanized by the mass importation of American mining machinery. It has therefore been necessary to design machines for longwall mining capable of operating in narrow seams under difficult conditions. Suitable continuous mining machines have now been developed and are in use in several collieries. One of the most successful of these combined coal-breakers and loaders is the Samson Stripper. This machine, which can operate in seams as thin as 3 ft. 10 in., planes off a strip of coal by means of a series of hydraulically-powered wedges.

The National Coal Board published in October, 1950, a document outlining its proposals for the development and reorganization of the British coal mining industry. Future plans envisage the adoption of horizon mining in new pits, a considerable increase in locomotive haulage and the development of pits capable of an output of 5,000 tons per day. Such changes must lead to increased efficiency and greater output, but it is doubtful whether the maximum benefit from improved mining methods will be obtained unless changes are made in the system of mine management. Many situations can arise in a mine where immediate action by the manager is necessary to avert stoppages and loss of output. If the manager has to seek permission

from some higher authority before instituting a major change in the mine he can easily slip into the habit of referring other smaller problems to his immediate superior. In most large Government organizations it is considered to be more reprehensible to take action, however timely, contrary to regulations than to take no action at all. Such a state of affairs will only be avoided in the nationalized coal mining industry if the mine manager is given more freedom of action than he now enjoys.

Some mines employing coal cutters are endeavouring to reduce the hazards and delays of shot firing by inserting into the shot holes a tube carrying a number of small pistons that break the coal by hydraulic pressure. In the U.S.A. they are achieving the same object by using a high speed cutter to make sufficient horizontal and vertical cuts in the coal face for the coal to break under its own weight.




**Typical example of roof bolting as practised in the new Mill Level of Telluride Mines Inc. in Colorado**

*(Courtesy of "Engineering & Mining Journal")*

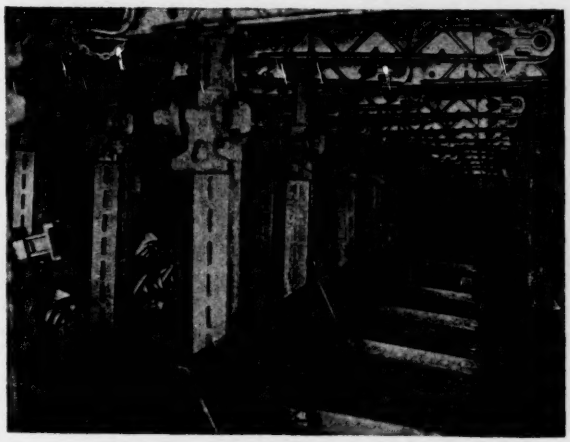
Experiments in the underground gasification of coal continues in many countries. Very little conclusive evidence has yet been published but it appears that the method may be commercially successful in narrow seams that cannot otherwise be economically worked.

**Support**

Timber of good quality becomes scarcer and more expensive every year and many mines now use steel or concrete for all except the most temporary supports. An original and important development in this field has been the introduction of roof bolting into American coal mines. The theory of this method of support has long been known and at least one mine has employed it for the past twenty years, but it has only achieved wide popularity since 1949. The advantages of roof bolting have, however, proved to be so marked that more than 200 mines now employ this system of roof control. In this method, the thin weak beds that are usually found above a coal seam, are anchored to a stronger upper bed by a series of steel rods that are inserted into vertical holes drilled in the roof. The rods or bolts, which are firmly fixed to the upper bed by expanding shells or wedges, are threaded at the lower end to take a large nut and a steel roof plate. As the bolts are inextensible, the weak beds are not able to impair the natural strength of the roof by sagging and separating. Roof bolting is cheaper than, or equal in cost to, more orthodox methods of support. Besides ensuring improved ventilation and added safety, it increases mining efficiency by eliminating all props from the working places. The resulting freedom of movement is especially beneficial where trackless mining is practised.

Although roof bolting is normally applicable only to flat bedded deposits its usefulness may possibly extend to other types of ore body and it has already been employed in tunnelling. Rods 5 to 10 ft. in length were installed vertically across the back of the drive with their ends beyond the assumed limit of arching. Three rods per section were found to give adequate support.

The increased use of concrete for underground support can be attributed in part to the fact that cement was the only commodity that became more plentiful in world markets in 1950. Some mines that employ block caving have now adopted concrete to the exclusion of all other means of support. Most caving systems incorporate scraper or scram drives connecting the draw points, and it is in these drives, which are usually subjected to heavy pressure, that concrete can be used to the greatest advantage. If a sufficient thickness of concrete is employed, the drifts can be left for some time without serious deterioration and when in use, the smooth floor and absence of all obstructions in the form of timber, etc., ensures a high output per shift.



**Showing the Huwood Python conveyor (light sections) right up against the face, with Schloms light Metal Alloy Roof Bars extending to the face, and with Schwarz Universal Props set behind the conveyor**

*(Courtesy of Hugh Wood & Co., Ltd.)*

Reinforcing of mine concrete has met with only partial success. Repeated blasting appears to cause cracking along the reinforcing steel. As a result, the concrete flakes and dis-

integrates more rapidly than it would if not reinforced.

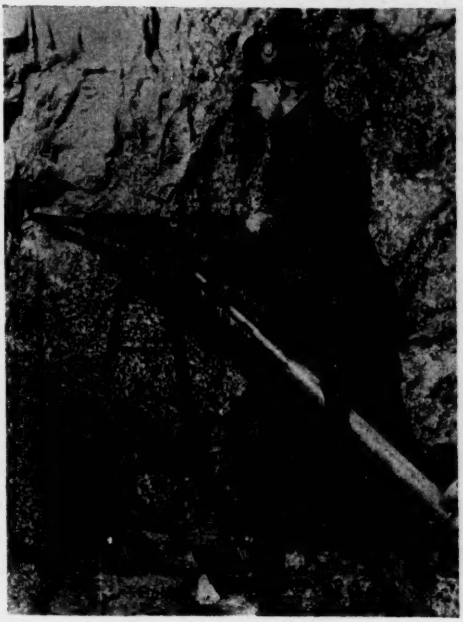
The most successful example of reinforcing is at McIntyre Porcupine where the sides and roofs of shaft stations and main drives in the lower levels are covered with sheets of expanded metal prior to guniting.

Support in European coal mines, where conditions are generally unfavourable for roof bolting, is often by means of aluminium alloy props and roof girders. A very effective design of this type of support, known as the Schlom roof bar has been developed in Germany and is now in use in Great Britain. These bars, 3 to 4 ft. in length, can be linked together by steel pins, thus ensuring continuous cover up to the coal face.

Aluminium alloys are now in general use in mines, not only in the form of supports but wherever lightness and strength are necessary. They are about one-third the weight of steel and even with the increased sections necessary to ensure equivalent strength they can effect a weight saving of 50 per cent.

**Haulage**

Where gradients permit, increased use is being made of large mine cars and either Diesel or electric-battery locomotive haulage. It is probable that the most effective haulage unit will prove to be a Diesel-electric loco in which the Diesel engine running at a constant and economical speed drives a generator capable of providing the electric power for the operating motor. This combination gives great flexibility with low running cost. A Diesel-electric shuttle car tested by the U.S. Bureau of Mines completed a loading and hauling cycle in 9 min. compared with the 15 min. required by a conventional battery-powered car.



**Testing a "dryductor" drill**

*(Courtesy of Holman Bros. Ltd.)*

**Ventilation and Dust Control**

The problem of dust in mine atmospheres continues to occupy the attention of engineers and scientists in most mining fields. In some British collieries dust has been suppressed by the injection of water at high pressure into the coal seams prior to breaking. In this method, which is most effective in the seams that show pronounced cleavage, holes 4 to 5 ft. in length are drilled in the seam at intervals of 20 ft. and water at a pressure of 100 lb. per sq. in. is injected through a steel tube that is inserted into the hole.

The introduction of roof bolting into American coal mines has raised a new dust problem. The bolt holes are drilled vertically into the overlying sandstone and water can seldom be fed into the hole, as drilling is usually by electric rotary drills. If a method of water injection could be devised for these drills, past experience has shown that it is almost impossible to prevent the water that runs down the drill from entering the motor. Where percussion drills are used, they are mostly driven from small mobile compressors and no water supply is available. Even where it can be piped to the drill, the disposal of the water from the hole is a serious problem, for if the floor of the working place is at all soft the heavy trackless shuttlecars will soon cause mud holes beneath the roof bolts.

The suppression of drilling dust by water injection is never entirely satisfactory and some method of dry dust extraction would be preferable; the announcement by a British mining machinery company that a successful dry drilling machine has been developed will therefore arouse much interest. Messrs. Holman have, after five years of experiment, designed a drill which extracts the dust down the middle of the drill steel, through the centre of the machine, and thence by pipe to a collecting point or separating unit. The introduction of such a machine will improve working conditions in all cases where high temperatures make a low moisture content of the mine air very desirable.

# The Trend in Mineral Dressing

By F. B. MICHELL, B.Sc., A.C.S.M., M.I.M.M.

DURING the past year there have been no startling developments or new processes but a steady improvement in techniques and a better realization of underlying principles.

## Crushing

In the field of coarse crushing very little has been seen. During the year Fraser and Chalmer built a 72 in. Blake crusher for installation underground in a copper mine.

Hammer mills have never found much application in ore treatment, often because of the heavy wear, when crushing siliceous ores but they deserve more attention for the reduction of friable or relatively soft ores as the reduction ratio is very high. The use of a double hammer type on Mechernich lead conglomerates and sandstones has been discussed in a recent paper where it is claimed that the galena is released from the gangue by selective grinding. On this class of material, both capacity and maintenance are said to be good and economically they appear to be sound on friable ores. Hammer mills have also been used to some extent on calcite-fluorspar ores and on oxidized gold ores where the presence of limonite makes them friable.

The ingenious Farhenwald design for a laboratory fine crusher is now offered by Mine and Smelter Co. of Denver, Colorado. It is said to reduce ¼ in. feed to 10 mesh in a single pass and is made in two sizes, namely a 6 in. and a 10 in. model.

## Grinding

Some valuable progress reports have been published on grinding at the Tennessee Copper Co. with the new Tricone mill which was installed last year. The shell has a 3° taper towards the feed to prevent any accumulation of small balls at the feed end whilst the new Dorr Hydroscilator is used for classification. With the new layout and low mill speed the efficiency of grinding is increased by 28 per cent over conventional units.

Ball wear has been studied at this plant and the conclusions are that there are two principles involved in the ball action.

Firstly, the rolling of round balls and secondly, a pestle and mortar effect, where round balls rub the concave faces of smaller balls which have become polyhedrons.

In the slow speed tricone mill, the balls remain round until they are about ⅝ in. diam., then begin to lose shape and become polyhedrons at which point they cease to roll and act as a mortar in which a larger ball can roll. The action in a faster mill is said to be identical, except that the round balls start to lose their shape much sooner but the concave faces on the polyhedrons do not appear until much later in their life.

There are still a number of questions which remain unanswered, however, such as: Does each sphere get a polyhedron concave face as a mortar? Which effect is best, round balls rolling or the pestle and mortar effect? or, Do larger particles in the mortar prevent sliming? One thing is certain, the tricone mill is more efficient than the older cylindrical mills. This may be because the mortar and pestle action starts earlier in the concave faces. Special balls with depressions have been made by Allis Chalmer for some years under the name "Concavex," obviously with this action in mind but have never been very popular.

In tests at Tennessee Copper Co., using 1 in. round balls and 1¼ in. concavex balls, the latter wore very flat and were a failure as efficiency fell off quickly, eventually leaving the concavex balls as flats only 1/16 in. thick. It would appear that these tests proved very little as the A.C. balls were not the same shape polyhedrons whilst they were much larger being 1¼ in. compared with ⅝-¾ in. and in consequence could not fit the interstices between the spherical balls in the same way.

More has been heard of automatic controls, which are being used increasingly in grinding circuits to assist in obtaining increased efficiency and a maximum throughput. One unit, the Massco Circuitron seems to be doing well and was developed by the Mine and Smelter Co. at Tellurides Mines Inc., Colorado.

This controls the feed rate depending on two factors, (*a*) the noise level in the mill and (*b*) the load in the classifier (*i.e.*, the amount of returned oversize) so that either or both may be instrumental in adjusting the feed.

The circuit is arranged in such a manner that an underloaded mill affecting the noise level will not increase the feed rate unless the classifier is capable of handling the increased raking load efficiently.

Harlowe Hardinge and R. C. Ferguson, in a recent paper have pointed out the advantages of operating a ball mill at relatively slow speeds whilst tests indicate that for a high level mill a speed of 50 per cent of critical gives maximum efficiency. For low pulp level operation, increased efficiency with reduced speeds may be assumed for soft ores but for hard ores, the results seem questionable.

From an economic point of view, grinding efficiency increases as the mill speed decreases and both power and ball costs decreases with a reduction of mill speed. Furthermore, it is claimed that a slow speed-high pulp level mill of sufficient volume to equal the capacity of a higher speed mill will make up the difference in capital cost in well under a year by saving in costs whilst if an existing mill of normal speed is replaced by a slower but larger one, the new mill will pay for itself in under two years.

## A New Theory of Comminution

There has been a valuable contribution to the literature on the theory of comminution in a paper by Fred C. Bond and Jen Tung Wang entitled "A New Theory of Communition." In this paper an empirical formula is given for determining the H.P-hr per ton in grinding and is given as $K \sqrt{\frac{n^{\frac{1}{2}}}{P}}$

Where K = 0.25 for soft, 0.5 for medium and 1.0 for hard ore.
n = reduction ratio.
P = 80 per cent product size.

A discussion of Rittinger's and Kick's theories is also given and a third developed by Jen Tung Wang and termed the strain-energy theory is suggested as satisfying conditions more nearly than either of the other two.

No claim is made that it is foolproof, but as Kick's expression obviously assigns too much energy to the reduction of the largest particles and Rittinger's assigns too much to the reduction of the very fine particles (apart from the fact that is not tenable from a viewpoint of mechanics—although it has been accepted because it appeared to fit experimental results), the strain energy theory appears to form a rationalization between both.

This is expressed as follows:

$$h = \left\{\frac{0.001748\ S^2}{S_r\ E}\right\} \left\{\frac{(n+2)\ (n-1)}{n}\right\}$$

Where h = H.P.-hr. per s.ton
S = ultimate compressive strength of stone in lb. per sq. in.
$S_r$ = sp gr of material
E = Young's Modulus in lb. per sq. in.
n = reduction ratio, that is, F/P where both are expressed as 80 per cent product size.

Ball size is still receiving attention and some Russian workers have suggested that the ball size is approximately equal to $6\ (\log \sqrt{\frac{d_s}{d}})$

Where $d_s$ = the size of the final product
d = size of the largest feed

Likewise in rod milling, Bond has been working on the question of rod diameter for optimum results and after a large number of investigations has produced the following expression:

$$R = \sqrt{\frac{0.156\ F}{N}} \bullet \sqrt{\frac{S}{G\ \sqrt{D}}}$$

Where R = Diameter of new rods, in in.
F = Micron size through which 80 per cent of the feed passes
N = Percentage of critical speed
S = sp. gr. of unbroken ore
G = Rod mill grindability at 14 mesh

The last value represents the ease of grinding in a rod mill and figures for various ores have been determined by Allis Chalmer based on actual laboratory tests.

The Aerofall mill, a dry version of the Hardinge Hansel unit has been reasonably successful in Canada and is reported to be very satisfactory on asbestos when it has achieved a reduction in one pass which formerly was performed by a number of stages, using jaw, gyratory and hammer mills.

**Classification**

In classification, the new Dorr Hydroscilator is proving an excellent machine at the Tennessee Copper Co. and the screen analysis of the rake product shows considerable improvement compared with a normal rake classifier, as can be seen from the following:

| Mesh | Rake classifier | Hydroscilator |
|---|---|---|
| + 48 | 23.4 | 33.6 |
| + 65 | 39.0 | 52.7 |
| +100 | 60.2 | 75.1 |
| +150 | 79.4 | 92.7 |
| +200 | 91.0 | 96.9 |
| —200 | 9.0 | 3.1 |

Increasing use is being made of the centrifuge principle for desliming and dewatering. The D.S.M. cyclone is being used for desliming flotation feeds and other materials when it can do the work more efficiently in a smaller space than the conventional hydroseparator. This is a great advantage in shift work as there is little hold-up of pulp. International combustion have put the Dynocone on the market, a centrifuge similar to the Bird machine and it is being used for dewatering coal slurries.

**Gravity Concentration**

There have been no big developments in gravity concentration apart from the ever increasing expansion of the heavy media separation.

At Sullivan, a 12,000 tons per day H and H plant now removes 35 per cent of the ore before fine crushing which consists mainly of barren quartz and chert gangue and is used as back filling in stopes. Feed to the sink and float plant is —1¼ in. plus 4 mesh where the density of the galena medium is maintained at 3.38.

The Williamson diamond mine in Tanganyika have installed a heavy media plant and a large unit was put into operation at the Premier Mine, Transvaal in the spring of this year, well ahead of schedule.

The new plant is said to be very flexible, compact and under similar economic conditions, cheaper per unit of capacity than the old plant.

In this layout all plus 10 mesh goes to the Cone where a sp. gr. of 2.87 is maintained at the overflow with 2.95 to 3.05 at the cone bottom. Medium consists of ferrosilicon, grade 65. The —10 mesh is jigged after desliming and the concentrates from both plants are treated on grease tables as before but at pressent all —35 mesh goes to dumps.

The first commercial application of the Hardinge heavy media separator to low grade iron ore has now been working 12 months at the Hill Trumbull plant of Cleveland-Cliffs Iron Co. whilst other plants are being installed.

Various shapes of separatory vessels are now being used and spiral rakes, drum separators, etc. are replacing the conical or pyramidical tanks in some instances.

Western Machine Co. (Wemco) have announced a two compartment unit which is capable of producing a middling. It uses two mediums of different density and is virtually two sink-float units in one assembly.

A new design of jig has appeared in the United States in which a separate diaphragm is used to activate the pen or draw-off compartment. It is claimed that discharge is under better control and this would appear to be a very sound addition as many operators will have experienced losing some of the bed by excessive bleeding of the discharge.

The Sullivan deck or Denver Buckman concentrator is doing good work in various places. They are being used on wolfram in France where good recovery is reported and are in use at Colquiri mine, Bolivia, for recovery of cassiterite, treating a feed carrying 2.13 per cent Sn. The tailing is said to carry 1.03 per cent Sn.

These frames are said to require little maintenance and the cost of the whole slime plant including flotation and fine sand treatment is $0.07 per ton milled.

Laboratory test work indicates that dispersion with sodium silicate gives better results, improving the sand-slime separation as well as better cleaning on the decks. This is in line with test work carried out on round frames in Cornwall. At the present time tests are being carried out with cyclones for desliming at Colquiri and promise to give good results.

**Flotation**

Very few new reagents have appeared this year but interest in this country is on the P.F. series. One member P.F. 12 is said to be specific for fluorspar and is giving excellent results in the production of acid grade spar at one plant in Great Britain.

The Hercules Powder Co. now offer their Rosin D acetate, a cationic reagent which seems to compare very favourably with other types.

A series of cation active reagents known as Gemex have also been produced in this country by General Metallurgical and Chemical Co. and include a number of water soluble reagents.

A line of wetting agents have also been introduced by Allied Colloids Ltd. of Bradford under the name of Alcopol. These are sodium dioctyl sulphosuccinate of various grades. Added as a spray they break down excessive froth, prevent skin flotation in tabling flotation concentrates and can be used as gangue dispersants whilst they tend to keep mercury clean in plate amalgamation. They are similar to the A.C. reagent known as Aerosol.

At the Eagle mill of the New Jersey Zinc Co. a new flow-sheet has been put into operation involving a

washing plant to remove slimes and dissolved salts ahead of milling in rod or ball mills.

The slime removed by washing is treated by bulk flotation of the galena and sphalerite using a small quantity of Aerofloat 25 and pine oil, this bulk concentrate is conditioned for half an hour with lime and cyanide to depress the zinc and iron minerals before it is added to the main selective flotation circuit.

The Quemont plant at Noranda, Quebec, which started in the summer of 1949, is now running very satisfactorily and is an example of the treatment of a complex ore in which copper, zinc and cupriferous pyrite are separated by flotation. The pyrite and some zinc concentrates are also treated in a counter current cyanide plant to recover gold and silver.

A great deal of work has now been done on the flotation of iron ores and a pilot plant has been operating for about three years at Canisteo where the Mineral Separation North American Corporation have proved that a combination of lime, starch and soap can be used effectively. The principle is to depress the iron with starch and lime, allowing the siliceous gangue to float. The starch is made up as a 2.5 per cent solution (causticized) and is fed at a rate of 2.3 lb. per ton to a conditioner where it is allowed to mix for one minute. In a second conditioner 3.35 lb. per ton of lime is added to bring the pH up to 11.7 whilst soap in the form of a saponified fally acid-resin mixture is fed in stages to the flotation cells at a total rate of 0.65 lb. per ton. It is stated that a rejection of 90 per cent of the silica is possible even when the feed carries 72 per cent of silica whilst a 55 to 61 per cent iron concentrate is produced with a silica content of 7 to 12 per cent using a feed carrying only 17 to 23 per cent iron.

When floating oxidized lead ores using sulphidization, the presence of calcium salts is usually detrimental and is particularly noticeable in arid areas where the calcium sulphate is found in solution, but according to Maurice Rey and associates, if sodium hydrosulphide is used instead of the ordinary sulphide the salt gives a lower pH and does not bring about immediate precipitation of the calcium which remains in solution as the bicarbonate. Alternatively, ammonium salts such as the sulphate or chloride may be added which markedly increases the solubility of the calcium carbonate. Their presence also accelerates flotation and reduces conditioning time.

Schuhmann has shown that barium and calcium salts activate cassiterite in alkaline pulps, whilst alizarin dyes act as depressors for this mineral and can be modified by adding barium or calcium salts which increase the depressing action of the dye.

A novel reagent feeder has been introduced on one plant to handle small quantities of liquid reagents utilizing the pressure of gas generated by electrolysis of acidified water to expel the reagent from the storage bottle. An 8v. battery is used to supply the necessary current and control is effected by means of a rheostat.

The separation of precious metals from anode slimes by flotation has been carried out at the State Research Institute, Helsinki, using Reagent 208 in a strongly acid solution with frother B-23 and tests show that 99.96 per cent of the gold and 99.41 per cent of the silver can be recovered in a twice cleaned concentrate containing 2 per cent gold and 40 per cent silver.

### Diamond Treatment

It has been found that grease tables which are used successfully for diamonds from primary ores, do not always collect alluvial stones which show water avidity. As a result tests have been conducted using electro-static separation which appear promising. After pilot scale tests a two stage separator was taken to the field and tried out at the Consolidated Diamond mines of S.W.

Africa. At the present time a plant size separator capable of treating about one ton of —6 mm. gravity concentrates per hour is under construction and is expected to be put into daily operation early in 1951.

**Coal Cleaning**

Fine coal washing in the United Kingdom is trending towards froth flotation and no attention is being paid to tables as in the United States, whilst it is rather strange that no coal cleaning tables have been made in this country.

With gravity concentration alone of course, better separation can be effected when the sp. gr. differential between the coal and shale is large whilst the flotation separation depends largely on the type of coal.

A high rank coal for example usually floats with about one-quarter the reagent consumption needed for a coal of low geological rank which usually possesses more oxygen in its composition. Furthermore, the type of shale plays an important part in the efficiency of the separation as a carbonaceous shale may tend to float and contaminate the coal.

**Gold Ore Treatment**

Very little has been written concerning gold recovery. The Golden Cycle, Carlton mill has been redesigned to treat Cripple Creek auriferous pyrite and telluride ores on a customs basis. After crushing, and grinding, flotation is used and the concentrate roasted in a Dorr fluosolid reactor. The calcine is then treated by normal cyanidation and zinc dust precipitation. The flotation tailing is also cyanided but the gold recovery is by the Merrill-Krebs Char Sorbing process.

In this process the gold values are practically all dissolved before the pulp reaches the point where the charcoal is added. This moves counter current to the pulp in the last three agitators and a small amount of charcoal enriched in gold values is removed continuously. This goes to the desorbing plant which is the Merrill-Byler-Dunn type.

In this process the absorbed gold and silver are removed by means of ammonia in solution operating under a pressure of from 80 to 120 lb. per sq. in. The very small amount of solution containing the gold is then treated by cyanide, lime and zinc dust to precipitate the gold and from this point is dealt with in the ordinary manner. The ammonia gas and solution is recycled through a high pressure ammonia fractionating column which is operated so as to effect substantially complete rectification and which delivers the ammonia gas as a top product, to be condensed in a condenser and delivered to an anhydrous ammonia storage tank.

The solution of gold has been studied by Fink and Putnan who have showed that sulphide ions, even at a concentration of less than 0.5 mg. per litre, may have a retarding effect on the dissolution of gold leaf.

This action cannot be explained by either the oxygen depletion or the thiocyanate formation theory and it has been suggested that an insoluble aurous sulphide film is formed on the gold which prevents the cyanide attact. Furthermore, salts of lead, bismuth and mercury it is claimed, decrease the time required for cyanide solution to dissolve gold leaf.

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# Review of Extraction Metallurgy

By GRAHAM OLDHAM, B.Sc., F.R.I.C., D.L.C., A.M.Inst.F.

THE field of extraction metallurgy is not one in which we normally find startling developments. The years show, rather, a record of steady progress and in this respect 1950 has been no exception. In this review the various metals will be dealt with in turn, with one notable exception, namely iron. Developments in this field although numerous and extensive are not, perhaps, of such interest to readers of *The Mining Journal* as are those in the field of non-ferrous metallurgy.

**Aluminium**

The purification of molten aluminium has been described by Wagner and Patterson[1]. One of the main contaminating agents is hydrogen, due to the fact that it shows great reactivity with molten aluminium. There are, of course, other contaminants which include carbon monoxide, carbon dioxide, oxygen, nitrogen, sulphur dioxide and methane. All of these may be introduced from the furnace atmosphere or during melting. The method of obtaining a pure product, as detailed by the authors, depends rather upon the prevention of contamination than on the removal of contaminants once they have been introduced into the metal. Therefore it is important that adequate precautions should be taken at each stage and these are outlined in the original paper. In addition, it is recommended that a sodium chloride—calcium chloride mixture containing between 5 and 15 per cent of magnesium chloride should be used as a drying agent and this, it is claimed, ensures a minimum degree of contamination.

An interesting patent claimed by H. Loevenstein[2] covers the purification of aluminium by distillation. It is, however, distillation with a difference in that the method uses the ability of certain volatile metals to entrain aluminium vapour. The entraining metal chosen must not mix with aluminium and for this purpose sodium, potassium, cadmium and several others are suitable. The entraining metal vapours are passed over a bath of the molten aluminium or aluminium alloy and the vapour is then condensed. The aluminium is separated by gravity and the entraining metal is then recycled. Due to a slight amount of contamination with the entraining metal a further distillation may be necessary. The process is carried out under reduced pressure.

The production of pure aluminium from aluminium magnesium alloy scrap is of considerable importance and a method for doing this has been claimed by D. H. Kelly and R. V. Townend[3]. The scrap, which may contain up to 10 per cent magnesium is first of all melted and the temperature raised to 1300-1350°F. Potassium fluoride is then added in amount equivalent to 0.5-2 parts for each part of magnesium present. The melt is then agitated in an inert gas atmosphere or the gas itself may be made to do the agitating by bubbling through. By this process the magnesium content may be reduced to 0.1 per cent or even less.

**Bismuth**

In 1949 a symposium on the refining of non-ferrous metals was held and the various papers on the subject were published in 1950. A paper relating to the refining of bismuth was given by A. R. Powell[4] and is of interest in that few papers have appeared on this subject in the past few years. The crude metal, which is of about 90 per cent purity is melted in a refining kettle, any crust formed being removed. Caustic soda and sulphur are then added to remove arsenic, antimony, copper, selenium and tellurium. The metal is then washed with more caustic soda in order to remove the excess sulphur and then skimmed. It is then transferred to a desilverizing kettle and treated several times with zinc containing 1-2 per cent aluminium in order to remove all the silver.

The metal is then chlorinated at 400°C in order to remove lead. The slag is once more skimmed off and the metal is treated several times with fused sodium bisulphate. After treatment once more with caustic soda the metal is cast into ingots.

The zinc is distilled off from the silver rich residue and this is then cupelled. The various bismuth containing crusts and residues are not, of course, wasted but are returned to the process at a suitable point for retreatment.

**Chromium**

The refining of chrome-rich melts in electric arc furnaces has been dealt with by R. Fischer[5]. The use of oxygen is now becoming common practice in the iron and steel industry and it is not suprising to find its use suggested in the non-ferrous metal industry. The author states that by using oxygen it is possible to refine 100 per cent charges of high alloy scrap. The amount of oxygen used per kg. of carbon was higher than has previously been indicated for unalloyed steel. As might be supposed it also varied with the initial amount of carbon, the degree of decarburization and the proportion used for secondary constituents such as silicon, aluminium, and titanium. It should, however, be pointed out that the higher melt temperatures had an adverse effect on hearth stability and also the author gives us no indication as to the economics of the process.

**Cobalt**

The refining of crude cobalt has been discussed in detail by P. S. Bryant[6]. This author has described a refining process from crude alloys containing 33-44 per cent cobalt, 39-47 per cent iron, and 11-18 per cent copper. The crude material is first of all digested in hot sulphuric acid. The cobalt and iron dissolve and the copper is filtered off. The ferrous sulphate formed is oxidized with sodium chlorate and sulphuric acid, precipitated with calcium carbonate and filtered off. The cobalt is then precipitated at 60°C as $CoCO_3Co(OH)_2$ with sodium carbonate. After boiling to coagulate, the precipitate is filtered and dried to about 10 per cent moisture. It is then calcined at 880° in a slightly reducing atmosphere using a single table rotary hearth furnace to produce CoO. Alternatively it may be calcined at 720° in an oxidizing atmosphere to produce $Co_3O_4$. The oxides are then leached with water and ammonium chloride solution. After drying they are then reduced to the metal in hydrogen. The accompanying photograph shows a view of the plant where this process is carried out.

**Lead**

Lead smelting at Przibram has been described by C. W. Jensen[7]. The lead ore in this district has a high silver content and it has now been mined for over 500 years. The main mine minerals are galena, stibnite, sphalerite, pyrite and chalcopyrite. The ore is concentrated by flotation and the concentrate preroasted at a low temperature in a wedge type multiple hearth roaster. It is then mixed with fluxes and granulated slag

and sintered. The sinter, which contains 42.8 per cent lead is smelted in the blast furnace and then refined in a modern Harris plant. The yearly production from this mine averages 2,000-3,000 tons of soft lead, 20-25 tons of silver and 2-3 tons of gold-containing silver. The recovery is quite good being 99 per cent for silver and 98 per cent for lead.

F. A. Green has given an account of the refining of lead at Port Pirie in South Australia[8]. The base lead bullion is first of all drossed in order to remove copper and it is then pumped through a small reverberatory furnace in order to oxidize the antimony and arsenic. A portion of the slag is treated with sodium carbonate and charcoal and a 10 per cent antimonial lead recovered. Silver and gold are removed in a desilverizing kettle using a molten zinc alloy. The small amount of zinc which dissolves in the lead is removed in a dezincing furnace. The silver and gold-rich alloy is retorted, cupelled and parted electrolytically. In order to obtain lead of high purity the partially purified metal is treated with caustic soda to remove arsenic and antimony and with zinc to remove copper and silver. It is finally treated with caustic soda and caustic potash to remove zinc and the last traces of antimony.

**General view of plant for extraction of cobalt**

*(Courtesy Murex, Ltd.)*

An unusual health hazard in the smelting and refining industry has been described by Morse and Setterlind[9]. In the particular process described lead was being refined. Arsenic and antimony were being removed by the addition of aluminium. It was found that the dross and also a sawdust concentrate dross became highly reactive when wetted and produced considerable quantities of arsine. It was possible to produce a concentration of arsine as high as 300 parts per million and a number of fatalities have occurred as a result of this. In order to reduce this risk the authors state that it is essential for the dross to be protected from contact with water and before any further treatment should be roasted for at least one hour at 1800°F.

**Manganese**

A very well known and widely used process for the production of pure metals is the method of alumino thermic reduction. This particular process has been discussed by T. Burchell[10] with particular reference to the production of manganese. The method as given is for ores containing about 90 per cent manganese dioxide. The ore is first roasted in a reducing atmosphere so that the oxygen to manganese ratio is not less than 0.353. This reduced oxide is then mixed with aluminium powder and fluorspar or lime fluxes. This is then ignited by a barium oxide aluminium mixture set off by a fuse. After removal of the slag crust, the residual manganese is of 99.5 per cent purity.

Chromium of a similar purity is obtained using a mixture of chromic oxide, potassium dichromate and aluminium powder.

**Nickel**

R. M. Müller has described a process for the production of nickel from serpentinic rocks[11]. Serpentinites having a low nickel content of the order of 0.25 per cent may be concentrated by electrolytic reduction. The melting point is high (1550°C) and the use of a flux is therefore necessary. The resulting melts are very corrosive and crucibles of alumina and magnesia are the only types not attacked at 1600°C. It is possible to achieve a concentration of nickel of as much as 20-30 per cent but an obvious disadvantage of the method is that the heat consumption is very high. Nevertheless the author is of the opinion that the process may yet prove economic provided that a method can be devised of recovering magnesia from the slag.

**Gold**

An interesting process for the recovery of gold from activated charcoal has been outlined by J. B. Zadra[12]. The gold-containing charcoal is first of all leached with a solution containing 30 gm. sodium sulphide and 40 gm. caustic soda per litre. Two litres of solution are required for each pound of charcoal treated. In the laboratory it was found that for a charcoal containing 300 oz. of gold per ton 97 per cent was extracted within four hours. The leached charcoal could be used for a large number of cycles without a serious decrease in efficiency. After the preliminary laboratory experiments a pilot plant was constructed which dealt with 50 lb. of charcoal every eight hours and this plant was run satisfactorily for several months.

G. L. Putman[13] has discussed the copper ammonia process for the cyanidation of complex ores. He states that the method is suitable for the treatment of gold ores containing gold tellurides and oxidized copper minerals, the use of ammonia promoting the precipitation of gold by zinc dust. The presence of relatively large amounts of copper does not, apparently, interfere, but an excess of calcium hydroxide will ultimately prevent solution of the gold and must, therefore, be avoided.

**Uranium and Vanadium**

As might well be expected a fair amount of patent literature continues to appear on the recovery of uranium, a subject which is not likely to lose its interest. A method for the recovery of vanadium and uranium from aluminous schists has been claimed by P. G. Brundell and S. H. Tjernström[14]. The schist, if necessary mixed with solid fuel, is impregnated with alkaline earth

oxides or carbon and then granulated and sintered. It is treated with chlorine or hydrochloric acid gas, either at the time of sintering or subsequently, the reaction gas being recycled. This yields the volatile chlorides of vanadium and uranium which are removed from the reaction and combustion gases. The metals are then obtained from the chlorides by conventional methods.

A method for the treatment of pitcheblende ores has been claimed by H. C. Thomas and A. S. Tomcufcik[15]. The ore is ground to below 40 mesh and is then digested with nitric acid to which sodium or ammonium nitrate has been added. This dissolves out uranium, radium, and lead and the insoluble matter is filtered off. Sulphuric acid is then added to the solution to cause precipitation of the radium and lead. The uranium is left in solution and the radium and lead can be separated by treatment with ammonium acetate which leaches out the lead sulphate.

A method which constitutes a variation in the electrolytic production of uranium has been claimed[16]. In this method one part of uranium is added to three parts of a mixture of alkali and alkaline earth halides at a temperature of approximately 800°C. Electrolysis is carried out in a graphite tank using an applied p.d. of 6 volts.

**Zinc**

As we have already mentioned in the section on lead, the slag from lead blast furnaces may contain zinc, and a method for the recovery of this has been claimed by G. F. Weaton and W. T. Isbell[17]. The slag is kept liquid by passing an electric current through it or through a layer of coke on its surface. The zinc volatilizes and the vapour is withdrawn from the surface and the zinc condensed out by passing through molten zinc. The spent slag is withdrawn from below the surface and the whole process may be operated continuously.

In reviewing the world's literature for a year it is inevitable that the picture is a little unbalanced. Patent literature, for example, may be of extreme importance or, on the other hand, may prove to be of no importance at all. It is really only on the long term view that the various pieces of the pattern fall into their correct place. It is, however, hoped that some of the papers at least which have been reviewed here will prove to be of interest to our readers.

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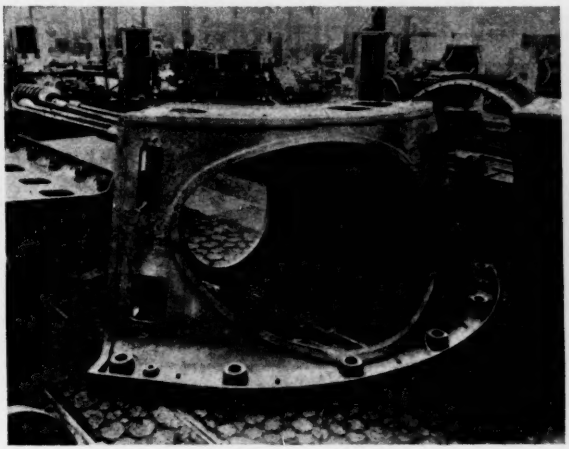
# Developments in Production of Alloys

By A. E. WILLIAMS, Ph.D., F.C.S.

CONSIDERABLE progress has been made in the field of alloys production. More attention is being given to the physical treatment of metals and the effects of this on their properties. In the steel industry, for example, there is an increasing tendency to buy steel by hardenability instead of by chemical composition. A large number of investigations has been made on alloy constitution and methods of working metals to improve their properties

## Ferrous Metals

In the field of cast iron metallurgy one of the most important advances made is the development by the British Cast Iron Research Association of cast iron which is ductile in the "as-cast" condition. The required ductility is achieved by adding certain elements which cause the iron to freeze with its graphite precipitated as nodules instead of in the customary lamellar form. In this type of structure the discontinuities in the metallic matrix are less extensive and stress distribution is more uniform, with the result that the product is ductile and of much higher tensile strength than normal cast iron. This method of production enables cast iron to be made having a tensile strength of 75,600 lb. p.s.i., with nearly 20 per cent elongation. This may be compared with an average ordinary cast iron having a tensile strength of about 20,000 lb. p.s.i., with no appreciable ductility. During the original investigations, the desired nodular graphite structure was produced by adding cerium to the iron, and it is suggested that de-sulphurization by the cerium addition plays an important part. In later developments, magnesium up to 0.10 per cent of the iron content has also been successfully used in place of cerium. Unlike cerium, the efficacy of magnesium is apparently unimpaired by high contents of sulphur and phosphorous or a low carbon content in the iron. For a given type of cast iron there is an optimum content of magnesium, below which a mixed structure is formed and above which the material becomes extremely hard and brittle.



**Section casting for pedestal of 42,300 h.p. Pelton Turbine cast in spheroidal-graphite cast iron. Finished weight 11 tons**

*(Courtesy Escher Wyss Co.)*

## Spheroidal-Graphite Cast Iron

Spheroidal-graphite cast iron, obtained by treatment of the molten iron with magnesium, has been developed by The Mond Nickel Co. Under cover of patents, the commercial production of castings in magnesium-treated iron is proceeding in many licensed foundries and some of this work is now being done on a mass-production basis. Some of the applications in which this new type of cast iron is specially suitable include:

(1) Casetings in which improved toughness and shock-resistance, with higher strength, are required. For these magnesium-treated spheroidal-graphite cast iron in the as-cast condition is usually suitable.

(2) Castings in which maximum toughness, ductility and shock-resistance are required. These are frequently made in irons of this class which have been subjected to a ferritizing annealing treatment.

(3) Castings of the two foregoing types in which reduction in section, made possible by the higher mechanical properties, leads to saving in weight.

(4) Heavy-section castings in which toughness and ductility are required, which are beyond the scope of malleable practice.

(5) Parts for which the properties of normal cast irons have been inadequate, which were not suitable for production in malleable cast iron, and for which, therefore, steel castings have been necessary.

Using spheroidal-graphite cast iron, the Chambersburg Engineering Co., U.S.A., has made castings with a tensile strength exceeding 60,000 lb. p.s.i., some of the sections having a thickness of 36 in. American experience with this new material shows that the design engineer now has at his command a high-tensile ferrous material which is easily castable and has such valuable properties as good vibration - dampening characteristics, high yield strength, excellent machinability and wear resistance, good impact properties, and high modulus of elasticity.

## Alloy Steels

Materials classed as alloy steels form about 6 per cent of the 16,000,000 tons or so of steel being made each year in this country. These alloys are applied principally to tool-making applications, the jaws of ore crushing equipment, the teeth of rock drilling bits and the essential working components of internal combustion and jet engines. An alloy steel may be defined as a steel which, in addition to the common constituents of iron and carbon, contains other elements added with the object of achieving particular physical properties. Elements such as manganese, silicon, sulphur and phosphorus—which are often present in steels not classed as alloys—may be increased to alter the physical properties of the metal; which latter is then classed as an alloy. The more common alloying elements for steel include chromium, cobalt, nickel, tungsten, molybdenum, vanadium, niobium, titanium, tantalum, etc. As the majority of these elements have to be imported and their price has increased appreciably, measures are being taken for the conservation of them as far as possible. The steel-maker's chief obligations in this

direction are to make the utmost use of the alloy content of scrap and to design steels which, with the aid of alloy picked up from scrap and with suitable heat treatment, will give the user the physical properties required with the least expenditure of "virgin" alloys.

From the user's side, the problem of alloy conservation is being solved by the design of components on the basis of the lowest practicable mechanical properties for any given duty; by segregating alloy steel scrap into compositional categories, for return to the steel-maker and by leaving to the latter as far as possible the decision as to the composition of the steel which will have the required properties.

The use of boron in steel to improve the hardenability has become an established practice and it is said that the increased hardenability results from retardation in the rate of nucleation of ferrite and carbide caused by the presence of boron in solid solution in the austenite. Consequently, it is only boron in solid solution—as opposed to that which is undissolved or present as compounds—that has any effect on hardenability. Since at heat treating temperatures it is possible to hold only a small amount of boron in solution, maximum benefits with respect to hardenability may be obtained with very small additions of boron. G. F. Comstock (*Iron Age*, 163, 1949) has investigated the joint use of boron and titanium in various types of low-carbon steel ranging from plain carbon to 18 per cent chromium, 11 per cent nickel material. The plain carbon steels gave greater hardness with additions of both titanium and boron than with either element alone, whereas the tensile properties of the alloy steels were greatly improved by the presence of 0.2 to 0.4 per cent titanium together with 0.02 to 0.03 per cent boron.

In investigations of the effect of boron on the mechanical properties of a range of low-carbon, low-alloy steels, the most outstanding results have been obtained from boron additions to steels containing 0.30 to 0.40 per cent molybdenum. One steel of this type, containing 0.14 per cent carbon, 0.40 per cent molybdenum, and 0.003 per cent boron, was found to have particularly desirable properties, giving a maximum stress of more than 40 tons p.s.i. and a yield stress of 33 tons p.s.i., with good ductility and toughness. A similar steel, containing no boron, gave a maximum stress of only 30 tons p.s.i. and a yield stress of only 16.9 tons p.s.i. The tremendous increase in yield strength resulting from boron additions renders this material particularly suitable for structural purposes, since the size of section used in construction may be substantially reduced, with corresponding savings in weight and material. The possibility of producing this type of steel on a commercial scale has been confirmed and several casts have been made successfully both in high frequency and basic open hearth furnaces with boron additions in the ladle.

**Zinc**

The most interesting recent developments in zinc alloys concern those containing small quantities of beryllium. These alloys are applied both to die casting and for hot and cold working. In the field of casting alloys a method has been protected by the B.T.H. Co., Ltd. (B. Pat. 638,733) during 1950, for the production of alloys with improved creep resistance and elastic properties. These new alloys lie in the composition range 1-4.5 per cent aluminium, 1-3.5 per cent copper, and 0.05-0.5 per cent beryllium, the balance being zinc unless small magnesium additions are made. After being cast in heated graphite moulds, the alloys may be subjected to heat treatment and cold working with a further improvement in their properties. Die casting acts as a solution quench, so further heat treatment is then unnecessary. The following properties may be obtained by die casting an alloy of composition 4 per cent aluminium, 2.7 copper, 0.13 beryllium, balance zinc: proportional limit 15,050 lb. p.s.i., 0.2 per cent yield strength 38,900; 0.5 per cent yield strength 43,300; tensile strength 47,000 with 7 per cent elongation.

Wrought zinc alloys containing small amounts of beryllium and copper are age hardenable, with maximum hardening occurring for ageing at about 175°C. These alloys possess excellent tensile properties in the unheat-treated condition, but maximum properties are obtained by cold work superimposed upon complete age hardening heat treatment. A new high strength zinc alloy termed "Zncube" has been developed during the past year in the U.S.A. (*Metal Bull.*, 1950. 3492. 21) and this material contains small proportions of copper and beryllium. It is said to have approximately the same strength and electrical characteristics as brass, but is cheaper to produce. It is claimed that the alloy can be easily machined, soldered and resistance-welded.

A contribution to the study of alloy systems has been made by D. W. Wakeman (*Met. Ind. Feb.*, 1950) in which a description is given of a recently evolved technique for the separation in a pure form of the constituent phases of an alloy. A suitable ingot, produced by slow cooling, is made the anode in an electrolytic cell with a nickel cathode. During electrolysis the matrix dissolves away, and the crystals of the intermediate phases fall to the bottom of the cell. The crystals are separated under low power magnification and can be analyzed. A description is given of the six phases occurring in the aluminium-manganese-zinc system and limitations of the method are discussed.

**Aluminium**

A process for the recovery of aluminium from crude aluminium-silicon alloy by extraction with molten zinc has been described in a recent report No. 4535 of the U.S.A. Bureau of Mines. In this process, zinc is added to the crude alloy in a ratio of about 12.5 parts zinc to one part aluminium, and a low melting point eutectoid separates out. It is then filtered at 400-450°C., the iron content being reduced to less than 0.1 per cent and silicon to 0.005 per cent based on the final aluminium metal. The zinc and aluminium are then separated by distillation, but unless this is done at reduced pressure or by circulation of an inert atmosphere, it is impracticable to reduce the zinc content below 6 per cent.

The creep behaviour of some new aluminium-copper alloys at high temperatures has been investigated by R. Syre (*Rev. Aluminium*, 163, 1950). In these tests, an addition of 6 per cent copper gave maximum mechanical properties, an elastic limit of 6.8 kg./sq.mm., a tensile strength of 13.2 kg./sq.mm., and an elongation of 30 per cent. Less and more copper gave lower values, up to 16 per cent copper, while the elongation decreased from 95 per cent at 0 per cent copper to 15 per cent at 16 per cent copper. It was found that silicon does not improve the properties of aluminium. The commercially pure cast aluminum, 99.81 per cent, has an extremely coarse grain in the solid state when slowly cooled from the liquid state because few nuclei are present in the molten metal, and few nuclei are formed on slow cooling, the velocity of crystal growth of the pure aluminium is not lowered by the small amount of impurities present, and sufficient time for grain growth is furnished by slow cooling. The fine grain produced by the addition of small amounts of refractory metals such as titanium and tungsten to aluminium slowly cooled from the molten state is due to the large number of nuclei produced by the additions. The refinement produced by the addition of substantial amounts of elements like manganese or copper to aluminium slowly cooled from the molten state is probably due to a slight increase in the number of nuclei and a lower velocity of crystal growth caused by the additions.

**Copper**

Supplementing earlier researches on the effect of bismuth on copper, A. P. C. Hallowes, of the British Non-

Ferrous Metals Research Association (*Jour. Inst. Metals*, 839, 1949) has described the effect of this undesirable element on the tough pitch grade. The presence of oxygen reduces the embrittling effect of bismuth and lowers the temperature at which maximum embrittlement occurs from about 550°C. in the phosphorus deoxidized variety to about 350°C. Even at this temperature, embrittlement of tough pitch copper does not become serious unless the material is first rapidly cooled from 750°C., or above, and cold worked.

Though unlikely to be of much practical value, it is interesting to note that certain copper-manganese-gallium and copper-manganese-germanium alloys are, like the well-known Heusler alloys, magnetic. Of more commercial significance is a patent claim (U.S.A. Pat. 2,445,868) that brasses comprising 53-75 per cent copper with at least 5 per cent of nickel and 5 per cent of manganese, the sum of these two elements being 12 and 20 per cent of the whole, are superior in colour and mechanical properties, including fatigue resistance, to the nickel silvers. It is possible that such materials, like those in the ternary copper-nickel-manganese system, might be heat treatable, though no claim to that effect seems to have been made. A new alloy containing 60 per cent zinc, 25 per cent manganese, 15 per cent copper, and a little aluminium is reported to have been successfully used for die casting.

**Nickel**

Results on the first year's work on binary, ternary and quaternary titanium alloys containing nickel carried out at the Battelle Memorial Institute have been recorded (*Jour. Inst. Metals*, Mar. 1950). Binary alloys of titanium with silver, lead, tin, nickel, copper, beryllium and other metals were studied, in sheet form. Relatively few data on the mechanical properties of titanium-nickel binary alloys are reported, because the alloys were found somewhat difficult to prepare in the arc furnace. The results of a preliminary study of 113 ternary titanium-base alloys are described and those containing nickel were of the following compositions: 2.5, 3.5 and 5 per cent chromium, with 1 and 2 per cent nickel, balance titanium. The 84 quaternary titanium-base alloys included additions of nickel ranging from 0.1 to 2 per cent nickel.

The effect of heat treatment on the structure of nickel-iron alloys has been recorded by E. Josso (*Rev. de Métallurgie*, Oct., 1950) who gives a detailed study, by dilatometric methods, of alloys of the following types: (1) Nickel-iron of the $Ni_3Fe$ type; (2) an alloy containing nickel 77, molybdenum 3 per cent, balance iron; and (3) an alloy containing nickel 74.5, copper 5.5 per cent, balance iron. From the large amount of experimental data recorded it is concluded that dilatometric analysis demonstrates clearly the nature of the anomalies, in expansion and contraction, associated with formation or breakdown of superstructure in alloys containing nickel in the region of 76 per cent. The degree of such anomalies lessens as the composition departs from that of the $Ni_3Fe$ alloy. The addition of small percentages of molybdenum, copper, etc., also has a modifying influence, although in the complex alloys the nature of the anomaly is intrinsically similar to that observed in the binary alloys. The addition elements mentioned bring the Curie point of the alloys to a temperature below that of the order-disorder transformation, and it is observed that the form of the transformation curve, and the temperature at which the transformation occurs, depend on the degree of superstructure in the lattice. It is concluded that, in spite of all the difficulties associated with the interpretation of magnetic measurements, thermomagnetic procedures are a valuable means of studying structural changes occurring as a result of heat treatment. By correlation of observations made by dilatometric and thermomagnetic methods the conclusion may be drawn that in the types of alloy investigated, production of atomic ordering is more easily achieved by quench-and-temper treatment than by slow cooling. Optimum tempering temperature appears to be in the region of 450°C. It is also noted that the more perfect the initial superstructure, the higher is the temperature at which transformation to the disorder condition takes place; 550°C. is the temperature applying to a well ordered lattice.

One of the newer applications for nickel-alloy steel is in the construction of mining drills and an article by J. H. Dewey (*Eng. Min. Jour.*, July, 1950) reports the experience of The International Nickel Co. and other mining companies in the use of alloy steel for churn drill bits in open-pit mining. When open-pit operations were started at one particular mine, churn drill bits of carbon steel were initially used, but service performance proved unsatisfactory, showing an average of only 1.7 ft. penetration per sharpening of the bits, for a total of 1,538 runs. Trials with various types of alloy-steel bits led to selection of nickel-chromium-molybdenum steel of S.A.E. 4340 grade with a carbon range of 0.41-0.46 per cent and for some years this material has been standard. Standardization of production conditions and of heat treatment of the steel are considered to be factors of the utmost importance in securing maximum service.

**Formation of Austenite**

Austenite formation during the tempering of nickel-manganese steel is the subject of a paper by E. F. Bailey (*Jour. Inst. Metals*, Aug., 1950) recording work undertaken to establish the kinetics of formation of austenite at various temperatures, the characteristics of decomposition of this austenite and the relationship between mechanical properties and phases present. A low-carbon manganese-nickel steel was selected for study on account of the known sluggishness of the decomposition reactions of this type of material. Composition of the steel is given as carbon 0.10, manganese 3.52, nickel 2.34, molybdenum 0.52, chromium 0.17, silicon 0.19, vanadium 0.15, per cent with traces of sulphur and phosphorus. Formation and decomposition of austenite were studied by dilatometric methods, results of which were checked by X-ray measurements. All specimens, prior to insertion in the dilatometer, were austenitized for one hour at 898°C. In the tests made to determine influence of tempering temperature on mechanical properties, the specimens were austenitized for four hours at the same temperature, cooled at a rate of 33°C. per min. from 704° to 149°C. and then subjected to heat treatments identical with those given to dilatometer specimens, to produce known amounts of austenite. Tempering treatments of 4 hours at temperatures of 593°, 648°, 675°, and 704°C. were used. The results obtained may be summarized as follows:

(1) In a low-carbon manganese-nickel steel, austenite appears to form at 659°C. during slow heating. However, upon prolonged heating between 538° and 659°C. up to 38 per cent of austenite may be formed. This austenite coexists with tempered martensite; (2) Upon tempering above 659°C., the austenite which forms may transform partially to martensite during cooling, and give rise to mixtures of retained austenite and tempered and untempered martensite at room temperature; (3) The austenite formed during tempering and retained after cooling to room temperature, lowers yield strength. Large amounts of retained austenite increase tensile strength, reduce elongation and reduction of area, and raise transition temperature in the Charpy V-notch impact test. These latter effects are attributed to decomposition of the austenite by plastic deformation during the test; (4) Martensite formed from decomposition of the austenite during cooling from the tempering temperature increase tensile strength, reduces elongation and reduction of area, and lowers notch toughness. Embrittlement caused by this martensite may be eliminated by re-tempering.

# Powder Metallurgy

WHILE powder metallurgy techniques were first applied to metals of high melting point, such as tungsten, which are difficult to treat by normal fusion and casting methods, a much bigger range of metals now comes within this field. Iron powders have been developed extensively for this purpose, and copper ranks second only to iron. Some metals, of which zinc is an example, are so easily die cast, that their use in powder metallurgy has not progressed so rapidly; their use has so far been limited to alloying additions in bearings and in certain types of brass parts. Both iron and copper powders are now sometimes coated with zinc by a cementation process to prevent their oxidation.

### Gases in Compacts

Until recently not much attention has been paid to the effects of gases in metal powder compacts, but it is now realized that these effects may be just as important in the sintering of compacts as in the solidification of castings. It is now generally accepted that any swelling and decrease in density during sintering is due to the effects of gases within the compact. In addition to entrained gas, there may be a thin layer of gas absorbed on the surface of the metal particles, while the latter may also be carrying an oxide film on their surface. When compacts produced from these types of powders are processed in a reducing atmosphere, an appreciable amount of steam is produced, and this is not always completely eliminated. Such entrapped gas tends to prevent the complete closure of the pores even after prolonged sintering. During 1950, research work has been carried out at Cambridge University on the influence of oxide on the pressing and sintering of compacts. This work entailed a careful study of the influence of oxide contents on the porosity of "green" compacts, and also the expansion and shrinkage observed when the compact was sintered in reducing and in inert atmospheres.

### Stainless Steel Powders

Two grades of stainless steel powder are described by G. Stern (*Materials & Methods*, 52, 1950), grade 140 being a 14 per cent chromium steel, and grade 188 a 17-18 per cent chromium, 8-9 per cent nickel steel. The powders are claimed to have good green strength and a degree of mouldability which permits production moulding of complicated parts showing good mechanical strength after sintering. Data are given for screen analysis, green strength, mechanical and physical properties of pressed and sintered compacts and corrosion resistance. The powders can be infiltrated with silver or copper.

A number of components from stainless steel powder are now being produced by the Amplex Division of Chrysler Corporation. Some of these are precision parts and include pre-heat valves for aircraft, porous machine parts which can be oil-impregnated for self-lubrication, filters, bearings and other parts. In some cases reduction in cost of production is claimed, in comparison with parts made from wrought stainless steel, while in others unique properties are obtainable due to the employment of powder metallury methods of manufacture. Metallurgists have developed the transverse rupture test in assessing the green strength of newly developed stainless steel powders in relation to that of existing commercial powders. The new powders are described as consisting of agglomerates of fine particles having many tentacular projections, and are characterized as sponge-like powders. Potential strength of the new products are stated to be approximately ten times as high as existing commercial powders.

### Copper Powder

Some details of the various ways in which copper is used in the preparation of powder metallurgy parts are given by W. Katz (*Metall.* 4. 81. 1950). These applications include bearings of copper mixed with 5-6 per cent graphite, tin bronze containing 10 per cent tin and 1-2 per cent graphite and lead bronze with steel supporting shells. The lead bronzes are either used as porous bearings or are compressed under such conditions as to liquefy the lead and yield a non-porous bearing alloy. Bronzes of 70/30 copper lead and up to 1 per cent tin, or of 60/40 copper-lead and up to 2 per cent tin, or of 80/10/10 copper-lead-tin have been used in this manner. Brasses may be used in the same way. Iron-lead and iron-copper sinter alloys have also been used in bearing manufacture. The addition of from 10 to 25 per cent copper powder to parts made of iron powder leads to increased tensile strength and porosity. This is due to an increase in the cohesion of the iron particles to one another and to copper. The microstructure shows that the iron particles are completely covered by a layer of copper, which must have been in the liquid condition at some stage of the process. Such powder mixtures require lower pressures in the manufacture of sinter parts. Sinter contact parts are also described, and tungsten-copper contacts, which could not be made by melting methods, are thus made possible.

### Alloys Formation

The formation of alloys by diffusion in powder metallurgy is discussed by P. Duwez (*Powder Met. Bull.*, 144, 1949), who studied the homogenization of compacts made of copper-nickel, copper-zinc and copper-tin, by means of X-ray diffraction and by recording thermal expansion curves during heating at a steady rate. The copper-zinc compacts exhibited abnormal expansions which were related to the presence of intermediate phases during the process of diffusion. In the manufacture of machine parts by compressing and sintering iron, the usual procedure is to form the parts from iron powder with a particle size of 0.06-0.3 mm., heat to dull redness, press into compacts and sinter at approximately 1,050°C. in an inert gas. The iron may be produced *in situ* by mixing iron ore, rolling-mill scale, or spongy iron of the required size with a reducing agent, e.g. a hydrocarbon, before pressing and sintering. For special purposes a very pure iron may be used, such as electrolytic or carbonyl iron. The porosity of the parts is controlled by the pressure used in compacting. For example, an article of 25 per cent porosity and density of 5.8-6.0 requires a pressure of 3 tons/sq. cm., whereas a density of approximately 7.0 requires 8-10 tons/sq. cm. Sintering increases the tensile strength greatly, for example, from 0.1-0.3 to 7-10 kg./sq. mm. for a body of final density 6.0. The sintered articles are commonly soaked in oil to improve their elastic properties and prevent rusting. One of the applications of sintered machine parts is to produce self-lubricating bearings. The average composition of the iron powder is: carbon, about 0.02 per cent; manganese, about 0.25 per cent; copper, about 0.2 per cent, with traces of silicon, sulphur and phosphorous.

The static electrification of various metal powders has been studied by A. R. Boyle (*Jour. Soc. Chem. Ind.*, 45, 1950), who investigated aluminium, ferro-manganese, magnesium, silicon and zinc. These materials were measured in two standard experiments in order to estimate the hazard likely to be encountered in handling them. Two grades of zinc powder were tested, containing 77 and 98.4 per cent

zinc, respectively. The author measured the charge produced by a given weight of metal dust falling down chutes of various materials, and when passing through sieves of different sizes and materials. The potential required to cause ignition during sieving under certain conditions was also investigated.

In the fabrication of certain special components, powder metallurgy is being applied to the sintering of metals with non-metals. For drills and grinding wheels the non-metallic material is usually diamond dust. In sintering such mixtures, mutual wettability of the components is essential.

**Sintered Magnets**

Sintered nickel-iron-aluminium permanent magnets, produced by powder metallurgy methods, have a density from 1 to 5 per cent lower than that of cast magnets, due to porosity and alumina inclusions. Investigations in this field have been carried out by H. Fahlenbrach (*Archiv. f.d. Eisenhüttenwesen*, Oct. 1949) and he examined the effect of these pores on the magnetic properties. A theoretical analysis of the various ways in which these defects, pores and inclusions, can influence the magnetic properties of Alni and Alnico magnets, and a comparison of theoretical values with actual measured values, indicate that the principal cause of reduced magnetic properties is an increase in cross-section for a given mass, in the sintered magnets. This conclusion was confirmed by microscopic examination of polished sections, which also revealed that pores and inclusions rarely enclose magnetic particles completely, but occur mainly as isolated patches. This work shows that sintered magnets of various sizes down to very small cross-sections can be successfully produced by powder metallurgy methods.

**Battery Plates**

According to H. Mandel (*Elec. Eng.* 619, 1950) the sintered plate type battery is the most recently developed in the nickel-cadmium alkaline battery field. It has a plate made by sintering nickel powder into a highly porous mass of about 80 per cent porosity, which is impregnated with the active materials. This construction is stated to be the most promising and it is on this type that development and research activity is being concentrated at the Signal Corps Laboratories, U.S.A. The general design of the sintered plate battery favours an increase in capacity per unit weight and volume, without sacrifice of such other valuable characteristics of the nickel-cadmium battery as high retention of charge, ability to stand for long periods in a discharged condition without deterioration, ruggedness and ability to deliver substantial capacities at high rates of discharge. Carbonyl nickel has been found to be peculiarly suitable for sintering highly porous, low-density plaques with good mechanical strength. As in the case of the lead-acid battery, the construction of sintered plate nickel-cadmium batteries with thinner plates spaced closely together makes possible the discharge of this type of battery at high rates and sub-zero temperatures.

In research work carried out by the Nickel Cadmium Battery Corporation, the influence of sintering conditions on nickel compacts was studied. It was required to develop a hardness test which could be used for differentiating battery plates which had been subjected to different sintering conditions, and in this connection the apparatus used for the tests employed a Ludwik cone as the indenter, and the maximum load was 350 kg. In addition to the determination of the influence of time of sintering on hardening, a study was made of the effect of the solid angle of the cone indenter. The results obtained to date do not establish any quantitative relation between hardness numbers and time of sintering, although a general qualitative relationship was observed. A change in sintering time from three to five minutes resulted in a considerable change in hardness, whereas at the 45 to 60 stage very little alteration in hardness occurs.

# UNION OF SOUTH AFRICA


**Year after year South Africa increases her contribution to the world supply of industrial materials. Below are sales figures for some of the most important metals and minerals produced in the Union during the year of 1950.**

| | oz. | £ |
|---|---|---|
| GOLD | 11,663,692 | 144,775,576 |
| SILVER | 1,133,645 | 300,693 |
| PLATINUM | 105,750 | 2,108,863 |
| | Tons (2,000 lbs.) | |
| COAL | 28,732,490 | 14,785,721 |
| COPPER | 38,747 | 5,620,773 |
| TIN | 592 | 367,169 |
| IRON ORE | 1,318,326 | 656,433 |
| CHROME ORE | 548,704 | 1,393,732 |
| MANGANESE ORE | 836,667 | 3,142,394 |
| ASBESTOS : | | |
| *AMOSITE* | 41,444 | 1,443,199 |
| *BLUE* | 24,582 | 1,533,600 |
| *CHRYSOTILE* | 10,273 | 653,395 |

***Information and literature may be obtained on application to:***

**OVERSEAS REPRESENTATIVE DEPARTMENT OF MINES**

**SOUTH AFRICA HOUSE, London W.C.2**

# South Africa

***By Our South African Correspondent***

SOUTH AFRICA'S income from mining is now approaching £200,000,000 a year, of which roughly three-quarters is due to gold. The total for all minerals last year was £193,794,000 compared with £149,682,000 in 1949. Of the improvement of £44,000,000 about £31,000,000 was due to the higher revenue of the gold mining industry.

The gold mines had an exceptionally favourable year. Thanks to the higher price for gold and to the mines' own efforts in keeping up the volume of production despite a necessary reduction in grade, the value of the year's output reached the new high record of £144,710,814 at the standard price. Sales of gold at a premium added another £2,123,547, making a total revenue of £146,834,361.

In 1949 the value of output was £114,899,043, and additional revenue from premium sales amounted to £1,066,286, making a total of £115,965,329. The previous record was £120,845,432 in 1941.

The volume of gold production was a little less last year. At 11,659,280 oz. it was only 48,733 oz. below the total for 1949. This was quite a remarkable achievement when allowance is made for the reduction in average grade from 3.942 dwt. per ton for 1949 to 3.759 dwt. for 1950. The reduction in grade would have been made after devaluation in any case since the mines' practice is to work as closely as possible to the average grade of their ore reserves; and, of course, the increase in the price of gold lowered that average as well as increasing the available tonnage by the inclusion of previously unpayable ore.

Other things being equal, there would have been a fairly substantial decline in gold production. But as the native labour supply in the first half of the year was the best for seven years—being above 300,000 for the first six months of the year—the mines were able to increase the tonnage milled by 2,633,650 tons to 59,515,200 tons, which offset most of the decline in gold output that would otherwise have occurred.

The following table compares the working results of the 43 mines listed by the Chamber of Mines with results in 1949:

| | 1950 | 1949 |
|---|---|---|
| Milled, tons | 59,515,200 | 56,881,550 |
| *Yield, f.oz. | 11,659,280 | 11,708,013 |
| Yield per ton, dwt. | 3.759 | 3.942 |
| Working revenue | £139,491,029 | £110,617,436 |
| Working revenue, per ton | 46s. 11d. | 38s. 11d. |
| Working costs | £87,956,643 | £76,667,643 |
| Working costs, per ton | 29s. 7d. | 27s. 0d. |
| Working profit | £51,534,386 | £33,949,793 |
| Working profit, per ton | 17s. 4d. | 11s. 11d. |
| †Dividends | £25,769,759 | £17,394,046 |

* Includes output of miscellaneous Witwatersrand mines and of those in other districts.

† The dividend figures include inter-company payments. After deduction of these the net distributions were: 1950, £24,699,544; 1949, £16,663,805.

As before, however, costs spoilt the appearance of the picture. The total working costs increased to a new record, and even though milling was raised by such a large tonnage, average costs per ton milled also increased. In normal circumstances, of course, the increased milling rate would have tended to reduce costs per ton, but other influences far outweighed this trend.

After devaluation, it will be remembered, wages and benefits were increased, with the result that working costs were raised by about 2s. per ton, which gave the year's costs a higher basis for a start. Then in July the mines found it necessary to debit to working costs a portion of the additional outstanding liabilities under the Silicosis Amendment Act, 1950, which gave retrospective increases in benefits. Next, higher wages were granted to mine mechanics, and payments, retrospective to January, were included in working costs as from October. The miners then made a demand for a further 15 per cent increase in wages, which, however, was refused by the Chamber of Mines. On top of these factors was another increase in railway freights and the general rise in the price level, which affected the cost of mine stores, food and equipment: the average cost of living index rose during the year by 7½ per cent.

Against record revenue, then, were record costs, but even so the mines as a whole remained far more prosperous than before devaluation, with an average working profit of 17s. 4d. per ton, against 11s. 11d. per ton in 1949 and 8s. 3d. per ton for the first eight months of 1949—*i.e.*, before devaluation.

**Developing Mines**

No large new gold mines were opened during the year, but considerable progress was made by the developing mines in the Transvaal. (The Free State mines are discussed in a separate article on page 135). Of most immediate interest was West Driefontein because it is the most advanced on the Far West Rand. Having obtained an average assay of 1,075 in.-dwt. in a short drive from the shaft (and later 1,098 in.-dwt. in initial development), the company announced that the first unit of the reduction works would be ready to start milling before the end of this year, an advance of several months on previous estimates.

The production date of Doornfontein was also advanced to the latter half of next year, and at this mine, too, a very high value was obtained in a reef intersection. Within the shaft perimeter a value of 1,052 in.-dwt. was given by the bottom band of the Carbon Leader zone.

In the Klerksdorp district (south-west of the West Wits line) Stilfontein should start production before the end of next year owing to the early acquisition last year of a considerable amount of heavy equipment. This is the mine with the reinforced concrete headgear, which has now been completed. The Vaal Reef was intersected in one shaft, yielding 274 in.-dwt., while a development drive gave 331 in.-dwt. At the shallow depth of 2,402 ft. good payability is indicated.

By the end of next year West Driefontein should have been in operation for some time with two 25,000 ton units of the reduction works; Doornfontein should have started with a 10,000 ton pilot plant; and Stilfontein should be producing at an initial rate of 40,000 tons a month. These three mines will therefore add a capacity of 100,000 tons a month to milling in the Transvaal in their early stages, or 1,200,000 tons in a full year. How soon the initial capacity is reached, and later expanded, depends largely upon the supply of labour.

**Diamonds**

For the diamond industry 1950 was also a prosperous year. With the New Jagersfontein and Premier mines in production, South African sales of diamonds rose from £10,035,484 to the new high record of £14,388,706 last year. On behalf of both South African and other producers the Central Selling Organisation sold diamonds last year to the value of £50,967,041, which compared with £28,444,186 in 1949 and the previous record of £38,058,843 in 1948. Part of this increase was due to the higher prices after devaluation. But as the average price was increased by about 20 per cent, while the total value of sales rose by nearly 80 per cent, it is obvious that the record total was mainly due to a big increase in demand.

Demand has been on a large scale since devaluation, and clearly it must have been increased last year to meet stockpiling programmes and expanding industrial needs. Gems accounted for the greater part of the rise in sales, the value (£38,357,698) being nearly double the gem sales in 1949 (£19,975,700) and greater than the previous record for gem and industrial stones combined in 1948. Industrial stones, however, made an important contribution to last year's total increase in sales by rising by nearly 50 per cent to £12,609,343 (against £8,468,486 in 1949).

A feature of South African diamond mining was that the Premier Diamond Mine, in which was found the famous Cullinan diamond in 1905, produced another giant stone last year weighing 195 carats and valued at more than £60,000. Its size was described as about "half the size of a matchbox." It was found in the normal recovery process on one of the grease tables.

**Record Coal Output**

Record production and sales in 1950 were reported by the coal mining industry. Marketable production increased from 28,104,585 tons in 1949 to 29,181,801 tons last year. While the collieries could still use more trucks than are available, the supply was sufficient last year to increase the sales tonnage from 27,569,246 tons to 28,796,111 tons. The value of sales last year was £14,838,750 (basis f.o.r., f.o.b. or f.a.s. for local, export and bunker sales respectively) against £10,157,869 valued at pit's mouth in 1949.

Included in the sales tonnage, exports of coal showed a gratifying rise of 31 per cent on the year. The total increased from 2,048,957 tons in 1949 to 2,690,975 tons last year. This, too, was chiefly a reflection of the improvement in railway facilities as the collieries could increase their exports considerably if physically permitted to do so. As exports comprise largely high-grade coal, the tonnage alone does not fully indicate the valuable addition made to the country's income, for the 2,690,975 tons exported realized £5,422,362, against £8,469,550 for the 25,677,748 tons sold locally (excluding bunker sales).

**Other Minerals**

The total value of other mineral sales in the Union amounted to £19,121,072, against £13,523,498 in 1949. There were several features in this group.

American and European demand for manganese kept the South African industry busy and sales agreements were negotiated to dispose of substantial quantities of ore for shipment for some years to come. Total production was 871,663 tons (against 722,211 tons in 1949) and sales totalled 836,667 tons (against 793,971 tons). The value of sales jumped to £3,142,394 (against £2,409,108). A further expansion in output is foreshadowed by the S.A. Minerals Corporation's decision to prepare for production on its manganese claims near Okahandja, in South-West Africa.

Although United States consumers restricted their orders for chrome in the second quarter of the year, total orders received by South African producers were large. S.A. Minerals Corporation announced that it had been necessary to take steps to raise output to meet the demand. Total Union production last year was 647,106 tons (against 445,723 tons in 1949). Sales reached 548,704 tons (against 355,475 tons), worth £1,394,246 (against £1,035,471).

As the Rustenburg-Union Platinum plants got into their stride, output of platinum and platinum metals was greatly increased. The total South African production last year was 256,385 f.oz. (against 120,000 oz. in 1949), and sales amounted to 105,750 oz. (against 94,092 oz.) valued at £2,108,863 (against £1,343,589).

Revenue from copper mining was outstanding among the base metals. At £5,620,930 last year, the total compared with £3,680,004 for 1949. The tonnage produced was increased from 34,519 tons to 37,598 tons and sales rose from 36,091 tons to 38,923 tons.

The asbestos group made further headway. Production of blue asbestos rose from 20,922 tons to 29,367 tons and sales from 19,941 tons to 24,582 tons, the value increasing from £1,077,763 to £1,533,600. In amosite the gains were less striking. Production increased from 42,129 tons to 43,712 tons and sales from 41,020 tons (£1,302,091) to 41,444 tons (£1,443,199). Chrysotile, however, continued its rapid ascent into the realm of the important commodities. Production jumped from 7,674 tons to 14,301 tons and sales from 7,942 tons to 10,273 tons. The value of sales rose from £384,110 to £653,395.

The fairly general rise in commodity prices, of course, played a large part in the increased values of many of the items mentioned, but the figures show that there was also a real expansion in output. The figures show, too, that the base metal industries are nowadays less overshadowed by the vast gold mining industry. They are now an important piece of the Union's economic structure, and their importance is likely to grow even more rapidly in the coming years.

# Southern Rhodesia

*By Our Own Correspondent*

ALTHOUGH the gross value of mineral output in Southern Rhodesia in 1950 reached the record total of £13,606,715, the increase of £2,332,264 over the 1949 figure was almost entirely due to sterling devaluation.

To illustrate this point, gold production, at 511,163 f.oz., was the lowest recorded since 1906, but devaluation had automatically increased the price of gold from £8 12s. 6d. to £12 8s. 3d. per f.oz., with the result that the value of gold production in 1950 was, at £6,344,822, the highest on record except for the years 1940-42, when output was averaging more than 800,000 f.oz. annually.

Devaluation has also increased the prices offered for some of the base minerals which together contributed £7,239,292 to the year's total. Enhanced prices have stimulated base mineral prospecting and development, but the outputs actually declared in 1950 show no great increase in volume.

While devaluation has had the immediate effect of prolonging the lives of many gold mines by bringing lower grades of ore within the pay limit, it has been partially offset by the simultaneous withdrawal of Government subsidy. Also, the cost of mine stores and rations for native labour has increased in consequence, so that, within 18 months of devaluation, the position is almost back to "normal"—with low-graders operating on a very small and diminishing margin of profit. To take one example, the operations of Bushtick Mines (1934) Ltd., with an issued capital of £500,000 and an annual turnover of nearly £200,000, currently show a profit of only 3d. per ton milled, or less than 1 per cent on working costs.

**Dependence on Rise in Gold Price**

It is in this context that one must consider the Southern Rhodesia Government's decision to seek the permission of the International Monetary Fund to sell a proportion of the Colony's gold output on the premium market. To many Rhodesian mines, the hope of survival is dependent upon an early increase in revenue per f.oz., whether this comes from an increase in the official price or from the sale of some gold at a premium of about 40s.

Under present conditions, the smaller gold mines cannot afford the wages demanded by natives for work underground, with the result that development programmes are lagging behind and the number of small producers is constantly shrinking. Since 1946 the total number of operating gold mines has fallen from nearly 1,000 to fewer than 600.

**Base Metals in Ascendent**

In the same period, the number of operating base mineral mines has risen from fewer than 60 to more than 200 and the gross output of base minerals has grown from a value of £2,912,628 in 1946 to £7,239,292 in 1950.

This trend is further reflected in the number of mining claims current in the colony. At December 31, 1946, current gold claims totalled 59,927 and current base mineral claims 98,165. Four years later, the total for gold is down to 44,107, while that for base minerals is up to 130,281.

The claims current for particular base minerals give a fair indication of the relative interest being taken by the mining industry. Thus, in the past four years, the number of asbestos claims has jumped from 9,959 to 32,817. Chrome ore claims, on the other hand, have remained fairly constant—70,909 in 1946 and 67,942 to-day. Copper claims rose from 1,686 at the end of 1946 to a peak of 3,007 at the end of 1948 and now stand at 2,373. Similarly, mica claims increased from 5,259 in 1946 to a peak of 6,314 in 1948, only to drop again to 5,130. Tin claims have risen steadily in the same period from 4,026 to 5,358, tungsten from 1,702 to 2,158, iron ore from 390 to 2,940, limestone from 1,306 to 2,850, phosphates from 420 to 990, lead from 140 to 973, magnesite from 558 to 918, tantalum from 103 to 502 and nickel from 30 to 180.

Compared with 1946, there are several newcomers in the 1950 list of claims current, notably beryllium (1,461 claims), vermiculite (1,030), antimony (642), aluminium silicate (573), silica (211), felspar (150), olivine (92), ochre (60) and talc (30).

**Base Minerals Production**

The following table, comparing short ton outputs in 1950 with those in the two preceding years, comprises the 12 base minerals whose output in 1950 exceeded £5,000 in value. They are arranged in order of financial importance.

| | 1948 | 1949 | 1950 |
|---|---|---|---|
| Asbestos | 68,897 | 79,638 | 71,527 |
| Chromite | 254,308 | 268,421 | 321,353 |
| Coal (raised) | 1,868,669 | 2,114,015 | 2,345,841 |
| Beryllium | — | — | 932 |
| Mica (block) | 322 | 96 | 84 |
| Tin (concentrates) | 182 | 119 | 105 |
| Limestone | 147,303 | 205,181 | 282,704 |
| Tungsten (concentrates) | 79 | 27 | 65 |
| Iron Pyrites | 14,578 | 18,705 | 15,223 |
| Iron Ore | 33,596 | 56,753 | 63,070 |
| Magnesite | 6,308 | 8,421 | 9,496 |
| Copper | 145 | 89 | 129 |

Although there was a fall of more than 8,000 tons in the output of asbestos fibre, the 71,527 tons mined in 1950 were valued at £4,615,490—an increase of £628,787 compared with 1949.

The Rhodesia Railways have failed to reach their target of 40,000 tons of chrome ore carried monthly to Beira; nevertheless, the 1950 figure shows an increase equivalent to an extra train-load per week and this improvement should continue.

Messrs. Powell Duffryn, Ltd., took over the management of Wankie Colliery on July 1 and they are now installing mechanical coal cutting, loading and conveying machinery in the hope of overtaking demand some time in 1951 and keeping pace with any further expansion. A proposal to extract oil products from Rhodesian coal is being investigated for the Southern Rhodesia Government by Messrs. Powell Duffryn Technical Services, Ltd.

**Significant Beryllium Output**

In its first year of production in Southern Rhodesia, beryllium has taken fourth place in the list of base minerals, with an output of 932.44 tons valued at £62,525. This mineral is being exploited mainly in the Victoria District, but small quantities have been won from four mines in the Salisbury District.

Explaining the slump in mica outputs since 1948, the Government Mining Engineer of the Salisbury District writes: "The principal producers, Grand Parade Associated Mica Mines, Ltd., have virtually withdrawn from the mica fields. The main causes of the decline are exhaustion of known lenses and unwillingness of producers to gamble large sums in exploratory development work in the face of market uncertainties, shortage of labour and realization delays. The chrome and tobacco booms have also had a substantial influence in enticing personnel from the mica fields."

The growth of limestone and iron ore production results from increased local demand from the steel and cement industries. Magnesite is finding an expanding market in South Africa.

In general, the mining industry has had another successful year, but rising working costs have revived old fears in the gold mining section and in the case of base mineral ventures have, to some extent, offset the stimulus provided by unprecedented demand coupled with high prices.

# Northern Rhodesia

*By Our Own Correspondent*

FOR the fifth successive year, there was a substantial increase in the value of mineral production from Northern Rhodesia in 1950. Provisionally valued at £48,702,142, the year's output showed an improvement of more than £13,000,000 over the total for 1949 and was more than £35,000,000 above the 1945 figure.

This rapid growth of revenue from mining operations is due to the steep post-war rise in the market prices of copper, lead and zinc, coupled with a 50 per cent increase in production of blister copper and zinc, a 25 per cent increase in producton of electrolytic copper and an increase of nearly 800 per cent in lead production. In 1945 the London prices per ton were: copper (electrolytic), £62; zinc, £31 5s.; and lead, £30. To-day they are copper (electrolytic), £202; zinc, £155; and lead, £136.

The progress of Northern Rhodesia's mining industry in the past six years reads almost like a fairy tale. It is only necessary to repeat the total value of mineral production in successive years to realize how this copper-lead-zinc "Cinderella" has been transformed into a "Princess"—1945, £12,962,522; 1946, £14,503,196; 1947, £23,521,483; 1948, £29,771,842; 1949, £35,579,543; and 1950, £48,702,142. From the commencement of mining operations to the end of 1950, the total value of Northern Rhodesian mineral production was £296,345,254.

Gold production in 1950 totalled 1,431.9 f.oz., the majority of this output, being recovered from refinery slimes. From the same source came 173,304 f.oz. of silver, valued at £43,258 and 27,056 lb. of selenium, valued at £21,645. In October, an output of 4.46 tons of beryl was declared at a provisional valuation of £312. Outputs of other minerals during 1950 are given below (in order of financial importance), together with comparable data for the two preceding years (all figures in tons):

| Mineral | 1948 | 1949 | 1950 |
|---|---|---|---|
| Copper (Blister) | 152,247 | 194,668 | 198,760 |
| Copper (Electrolytic) | 61,368 | 64,413 | 76,804 |
| Zinc | 22,170 | 22,850 | 22,715 |
| Lead | 13,020 | 13,945 | 13,685 |
| Cobalt Alloy | 1,031 | 1,356 | 1,746 |
| Limestone | 79,900 | 106,824 | 107,160 |
| Copper (Concentrates) | 203 | 323 | 289 |
| Manganese Ore | 3,898 | 3,975 | 1,723 |
| Tin (Concentrates) | Nil | 9.52 | 5.40 |
| Mica (Sheet) | Nil | 3.34 | 2.20 |
| Silica Rock | Nil | 1,203 | 165 |

**Increasing Wages**

The increased prosperity of the copper mining companies has emboldened both European and Native mine-workers to claim an increasing share of the enhanced profits. The European mineworkers failed in their plea for a progressive reduction of the normal hours of working from 48 to 40 per week; but the Native mineworkers secured wage increases and bonus payments which are estimated to cost the companies an extra £385,000 a year.

The cost of labour in the mining industry of Northern Rhodesia now approximates to £7,000,000 a year. The total labour force employed on mines has risen from approximately 3,000 Europeans and 31,000 Natives in 1945 to nearly 5,000 Europeans and more than 38,000 Natives in 1950.

Coal supply continues to be a limiting factor in the expansion of output from the Copperbelt, but the supply available from the Wankie Colliery, in Southern Rhodesia, continues to increase and there is a prospect that it may overtake demand sometime in 1951.

# East Africa

By W. E. SINCLAIR, M.I.M.M.

THE mineral areas of the East African territories cover a very wide field and a review of the prospecting and mining activity in this report must, of necessity, be brief and sketchy. Unless otherwise stated, tonnages quoted refer to long tons.

## Tanganyika

The value of the total mineral production in 1950 reached the record high of £1,836,283. Even this, however, does not reflect the full extent of the greatly increased mining activity in exploratory and development work that is taking place all over the country.

*Gold.*—A smaller gold output—65,127 f.oz.—was recorded in 1950. Heading this list was the Geita Gold Mines and their subsidiaries in the Saragua goldfield near Mwanza. These mines, under the control of Kentan Areas, have now completed the largest and most up-to-date mill in the country. The next major producer is the New Saza Mine in the Lupa district. Another steady producer is the Buhembe Mine in the Musoma area. The Mara Mine and Sekenke Mine on the Iramba Plateau, together with a number of smaller concerns and individual workers all help to swell production.

*Silver.*—The output of silver has increased in sympathy with gold, and as this metal is a by-product of gold and lead mining, production is dependent mainly on the extent and output of the metals with which it is associated. Output was 31,014 f.oz.; value £8,263.

*Diamonds.*—In 1950 the output amounted to 70,597 ct.—value approximately £750,000. This yield came mainly from the famous Mwadui diamond pipe near Shinyanga. Other mines, such as the Alamasi Ltd. and smaller producers have contributed to the total production. The continued development and exploitation of the "Williamson" Mine, however, seems to prove this pipe to be a valuable deposit containing stones of both gem and industrial quality.

*Tin.*—The production of tin ore, despite intensive prospecting activity in the Karagwe tinfields, totalled 129 tons valued at £72,311.

*Salt.*—Exports in 1950 amounted to 3,935 tons. Some interest is being shown in other salt mineral products which occur in alkaline solutions or as trona in certain of the salt lakes in the country.

*Mica.*—Because of its widespread distribution, this mineral is one of the steady producers. The output in 1950 dropped to 111,782 lb. of sheet minca, value £56,163.

The recovery of ground and waste mica (approximately 83 tons, value £1,560), has been sporadic but is likely to increase from reclamation of old dump stocks and lower grade reserves, in addition to which development of new ore bodies of muscovite mica continues in several of the mineralized areas near Mbeya, Morogoro and Ikola near Lake Tanganyika.

*Lead.*—Towards the end of the year, the Uruwira Minerals Ltd., produced the first shipment of lead ore from their Mpanda Mine and, following this, other shipments brought the total output up to 1,093 tons valued at £92,100. Further development of this mine and the continuation of the exploratory work to investigate the existence of economic copper and other mineral ore bodies, has been greatly assisted by the completion of the branch railway which unites Mpanda with the central railway system at Kaliwa, 120 miles distant.

*Tungsten.*—Wolframite has been mined in small quantities in the Bukoba district for years. An increasing demand and higher price last year created greater activity in the exploitation of the mineral, and this resulted in an output of 40.5 tons, valued at £14,103.

*Kaolin.*—A small erratic production of china clay—18 tons—was recorded during the year. This is probably the commencement of a considerable industry in this mineral, since the New Consolidated Goldfields have, after extensive exploratory operations, now taken over the large kaolin deposit in the Pugu district near Dar-es-Salaam.

*Development.*—The new branch railway to Mpanda is the first step in plans which are being discussed for further connecting rail links that will assist materially in the work of prospecting the many mineral occurrences which are known to exist in inaccessible parts of the country. Meanwhile, several large companies are engaged in prospecting operations by means of aerial and geophysical surveys and ground exploration.

The Union Corporation Ltd. is exploring an 800 sq. mile concession to the south of the Mpanda district, which is regarded as being another likely gold and diamond field. Many base minerals are also reported to occur in this region. A Canadian company, the Southern Mining & Development Co., Ltd., has been registered and is preparing to carry out an extensive exploratory survey, mainly to search for nickel, copper, lead and zinc. Another Canadian company, the Nickel Corporation of Canada, has also taken up a prospecting licence over a thousand square miles of the central region, to explore its potentialities, particularly with regard to chrome.

Besides the active exploration by these companies and smaller concerns and individuals, there have been a number of enquiries and investigations concerning the economic prospects of asbestos, graphite, beryl, manganese and other minerals which have been located by the Geological Survey in different places.

*Iron and Coal.*—Government Geologists are co-operating with engineers of the Colonial Development Corporation in the determination of the value and extent of the iron ore occurrences and the possible development of valuable coalfields in these wide areas.

Coal resources have also been examined in the Ruhuhu and Songwe fields which are in fairly close proximity to the magnetite iron ore deposits. The coal produced, so far, lacks good coking qualities, but is being tested locally as boiler fuel, and, as such, would prove of inestimable value, apart from its value as a possible source of oil.

## Kenya

*Gold.*—Following a gradual decline in the past ten years, the 1950 output of 31,314 oz. while it does not constitute an outstanding step-up in production, promises, nevertheless, a steady increase in production of the yellow metal in the future.

At the moment, the principal gold producers are, first the Rosterman's Mines, operating in the Kakamega area, which accounted for more than half the total output; second, Kenya Consolidated Ltd., which with Ngiga Mining Co., operates in the Kisii area, to the west of Lake Victoria. Also, in this area is the original Macalder Mines, now coming into operation as the Nyanza Mines Ltd., under the control of the Colonial Development Corporation, who, after an intensive drilling and development campaign, are erecting a new plant to treat the complex sulphide copper-zinc-gold ore that constitutes the ore body.

The Kerebe Mines and several smaller propositions and individual workers, combine to produce the total gold output.

Encouragement is also now being given to gold mining development by a Government scheme to make a grant to producers to cover a proportion of the cost of new and approved underground development. This should serve as an added incentive to prospectors to explore the vast tracts of country, as yet unscratched, for hidden gold reefs. Indeed, gold production has already benefited from the development and exploitation (by individuals) of very rich reefs at Kibigori on the Nandi escarpment and in the Lolgorian area.

*Base Minerals.*—With a fair assurance of a more stable demand and the steadily increasing prices, more attention has been directed to the development of this section of the mining industry, and there has been a definite increase in the expansion of the minor minerals.

*Mineral Salts.*—During the past year there was a decided step-up in the production of soda-ash and other products from Lake Magadi, where the Magadi Soda Co. (Imperial Chemical Industries Ltd.) continue to increase their operations. The output of soda ash alone in 1950 rose to 95,570 tons. In addition, 16,855 tons of salt was recovered from this unique lake deposit.

*Diatomite.*—The development and production of this mineral (Keiselguhr) steadily increased from the deposits at Gilgil in the Rift Valley. A total output of 3,570 tons valued at nearly £40,000 was produced.

*Kyanite.*—The output of this "refractory" mineral from the Murka Hill deposits near Taveta was 11,469 tons in 1950, a drop to a little more than half the 1949 production.

*Asbestos.*—Asbestos production from the West Suk area rose to 224 tons for the year, and there is likely to be an increasing output from this and other areas in the future. The prospecting and investigating of an occurrence in the Teita Hills gives promise of a source of supply of good quality anthophyllite asbestos.


*Mica, Vermiculite, Soapstone.*—A start was made during the year on the production of mica, and an output of five tons was recorded. In addition, three tons of vermiculite was produced and 318 tons of soapstone.

Although work has been done in different localities on opening up gypsum, graphite, magnesite, permatite and talc, and other secondary minerals, there was no substantial output reported in the period.

*Corundum and Pyrites.*—A newcomer on the production lists is corundum. A small output of 1,546 lb. is recorded, while a pyrites body of good quality is being opened up on the Kakamega goldfield.

*Coal.*—Thin seams of coal have been noted at different places and during 1950 two prospecting licences were taken up to investigate the indications.

Extensive exploratory work is required to prove the value of the base metal occurrences and the coal indications. Considering the investigations proceeding, both by the Geological Survey and private enterprise, there seems little doubt that the coming year will see more decided mining development.

**Uganda**

*Gold.*—There has been nothing new to report, even though some exploratory work has been undertaken on the possible extension of the Kakamega goldfield near Busia. Output dropped in 1950 to 586 oz.

*Copper-Cobalt.*—The chief development has been the increasing activity on the Kilembe copper-cobalt deposits, where exploratory work has advanced from the geophysical stage to underground development, which has fully justified the construction of a mill, and work along these lines, controlled by the Frobisher Group of Canada is progressing actively.

*Tin.*—The phenomenal price of the white metal during 1950 created intensive activity in prospecting and mining in the Ankole district, where a new find was reported near Kanungi. The Kagera Tin Mines Ltd., the oldest producers in the country, and many smaller companies centred round Kikagati, combined to produce 263 tons in 1950.

*Columbite.*—The output of this mineral, like tin, was more than doubled during the year at 5.1 tons.

*Wolfram.*—The improved demand and price for the tungsten minerals created a marked activity in the mining of wolfram. A new wolfram mine was opened up at Maserere in the Kipezi district, and the Mporo Mining Co. has continued to develop its tungsten deposits at Kabale; this, with other producers, recorded a total output of 199 tons in 1950.

*Amblygonite.*—The production of this rather uncommon mineral (fluophosphate of aluminium and lithium) was more than maintained, 265 tons being produced during the year.

*Lead.*—Output of galena was increased from 48 tons in 1949 to 53 tons last year.

*Beryl.*—Production of this mineral, recovered previously as a by-product of mica and columbite mining, was also increased by 10 tons to 43 tons in 1950.

*Bismuth.*—A new bismuth deposit was opened up in the Lubiza area, Kipezi district, and production from this source will probably add to the total output of 6.6 tons for last year.

*Iron Ores.*—Development of the iron ore deposits near Mt. Elgon is proceeding. This ore contains about 3 per cent of titanium and is considered to be of future potential value, particularly with the coming of electrical power from the Owen Falls scheme which is in process of construction. The first unit should be operating in 1953 by which time there should be a considerable demand for power by industry, including that of the bigger mining potentials, such as the iron ore developments and the copper at Kilembe.

# Moçambique

*By Our Own Correspondent*

MAIN interest for 1950 remains the uranium ore find in the District of Tete. Mining activity in the area was confined to the shipment of hand-picked concentrates averaging from eight to ten per cent $U_3O_8$, and altogether some 80 tons have been shipped. The concessionaires have simply evolved a system whereby gangs of natives are sent out to collect as much surface ore as they can and they are paid accordingly. The estimates of the extent of the deposit vary considerably but a salient fact that emerges is that although the reef formation is of considerable length the concentrations are somewhat sporadic. Nothing definite can, of course, be said until the report of the Government Geological Survey of this deposit has been published. It is the aim of the Government to correlate all geological information so as to demarcate as clearly as possible the full extent of the uranium ilmenites.

**Completion of Railway**

The year also saw the termination of the railway connection from Beira to the Tete coalfield. A great deal of expansion has taken place in the development of the Moatize coal mine in order to bring the mine to full production. Unfortunately, the high ash content of the upper layers of this coal belt may prove a serious obstacle that will necessitate the installation of a washing plant. Markets for good coal are available and the cement factory nearing completion at Dondo, near Beira, will be an important consumer of slack coal which now has no market.

In other parts of the Colony, pegmatite formations are eliciting enquiries from foreign companies, especially those that contain samarskite and beryl. Such a formation exists near Ribaue, in the Province of Niassa, but has been neglected by the owners for the past three or four years because of lack of capital. In the Province of Manica and Sofala another pegmatite formation is now being actively prospected for tantalite. The alluvial tantalite in the sands assayed 60 per cent $Ta_2O_5$ and is said to occur over a wide area. In the near future, it is hoped to have sluices and jigs installed to commence washing operations.

The high price of tin has not brought with it any increased activity on the part of the owners of some of the Inchope Tin claims. The cassiterite occurs in a quartz gneiss up to as much as ½ per cent and the tonnage is enormous. Lack of capital and water have held up development, but this field appears ideal for treatment by dry table concentration.

**Decline of Gold Mining**

Gold mining again declined throughout the year and at present in the Manica District there are no more than four small workers producing, and this is, of course, due to the fact that over the past 50 years all the outcrops and surface reefs have been worked and all that remains now is that which is to be found at depth. Only companies strongly capitalized can undertake deep level mining and development during these days of increasing material costs and up to the present there has been no conclusive evidence that good gold values are to be found at depth.

In general, therefore, all the work that has been done during the Government prospecting campaign has failed to bring to light large deposits of strategic minerals which are easily accessible of road and rail communication. It is only right to say that the area of country covered is no more than about one third of the entire Colony, but further work of a more comprehensive character will have to wait until the projected rail and road extensions into hitherto virgin country is completed.

# British West Africa

THE value of the present annual production of minerals from the three principal West African Colonies exceeds £20,000,000, with gold, diamonds, tin, manganese and iron-ore predominating.

## Nigeria

Labour employed in the mining industry in 1950, excluding that engaged in coal mining and on prospecting work on open ground, was 60,474, including 335 non-Africans. Total wages for the 15 months to March 31, 1950, amounted to £3,009,356, and in addition to direct revenue received by the Government by way of royalties, fees, etc. and to the sums paid in company and income tax, the Colony benefited by the further expenditure by mine operators of the sum of £1,007,673 on railway freights and purchase of materials in Nigeria.

Mineral exports for the nine months to September, 1950, were as follows:

| | QUANTITY (tons) | | VALUE (£) | |
|---|---|---|---|---|
| | Jan./Sep. 1950 | Jan./Sep. 1949 | Jan./Sep. 1950 | Jan./Sep. 1949 |
| Cassiterite ..... | 8,154 | 9,461 | 3,844,818 | 3,939,047 |
| Coal ..... | 424,855 | | 978,727 | |
| Columbite ..... | 734 | 692 | 287,209 | 165,775 |
| Lead - Zinc ore | 54 | 60 | 3,846 | 2,858 |

The total value of Nigerian mineral exports from 1914 to 1950 has amounted to £93,667,039, made up as follows: Cassiterite — £81,134,975; Coal — £6,971,894; Gold — £2,513,790; Columbite—£2,729,887; Lead—£116,423; Zinc — £35,937; Wolframite — £128,299; Tantalite — £35,834.

*Gold.*—Production during first nine months of 1950 was 2,072 f.oz., compared with 2,272 f.oz. Little interest is being taken in gold by operators at the present time. Most of the gold won is absorbed internally, where it has been selling at approximately £15 to £16 an ounce, and it is probable that the declared output does not represent all the gold mined. In this connection it is interesting to note that in 1939 the total production of gold amounted to 24,458 oz.

In addition to the above, 0.56 tons of tantalite and 2.05 tons of wolframite were produced in the nine months to September, 1950, the figures for the corresponding period of 1949 being 1.35 tons and 3 tons, respectively.

*Coal.*—Production is now at the rate of 600,000 tons a year, and shipments are being made to several European countries, including Great Britain.

*Tin and Columbite.*—The labour position in the tin mining industry can, generally speaking, be regarded as fairly satisfactory. Decreases in the production of the metal by some of the companies has been chiefly due to shortage of water and curtailment in the supply of electrical power to plants. Prospecting is being energetically carried on with a view to the location of unworked tin-bearing deposits.

Nigeria is the most important world producer of columbite, a mineral which is becoming increasingly important for special steels such as those used in gas turbines.

Estimated reserves of cassiterite and columbite at March 31, 1950, were 131,783 tons and 9,276 tons, respectively.

*Silver/Lead/Zinc.*—While local difficulties have prevented the commencement of drilling for oil in commercial quantities, considerable progress is being made towards the development of the lead/zinc/silver project in the Ogoja province of Southern Nigeria. A large tonnage of high-grade lead ore has been partially proved at Nyeba, and an even larger tonnage of lead and zinc ore indicated by drilling at Ameri. The area gives evidence of being underlain by extensive deposits of lead and zinc ore and arrangements have been made by The American Smelting & Refining Co. to initiate an exploration programme spread over two or three years.

*Power.*—The three hydro-electric power stations on the Plateau minefield generated 68,727,490 units during the fifteen months to March 31, 1950, 93.48 per cent of which were sold to the mines.

## Gold Coast

The labour force employed in mining is approximately 36,000, including nearly 1,000 non-Africans. The labour transit centre set up in the Northern Territories is now operating successfully.

It is estimated that the expenditure in the Colony by the mining companies for the year 1949-50 amounted to nearly £7,000,000, of which about £3,380,000 was paid in wages and salaries.

The total value of the minerals, excluding silver and bauxite, produced in the Gold Coast during the past 70 years amounts to £216,998,954, taking gold at its pre-1931 value.

*Gold.*—For the calendar year 1950, production was 689,429 f.oz., valued at £7,474,576, the 1949 production being 676,931 f.oz.

Ten companies are producing gold from lode mines and one from alluvial operations. Tonnage of ore crushed was 2,334,892 for a yield of 5.82 dwt. per ton. Ashanti Goldfields Corporation headed the list of producers with 191,986 f.oz., the next highest being Ariston Mines Ltd. with 96,175 f.oz.

Ashanti Goldfields Corporation's profit for the year to September 30, 1950, before tax, was £1,133,789, as compared with £663,583 for the previous year; this emphasizes the substantial benefits conferred on the mining industry by devaluation. The company's underground developments continue to be good, and working profit for the three months to December 31, 1950, was £270,579.

Developments at Bibiani continue satisfactory. The company's profit, before tax, for the year to September 30, 1950, amounted to £307,843, against £81,925 for the previous year.

Mining revenue of Ariston Gold Mines Ltd. for the year to September 30, 1950, was £1,267,772, the net profit of £495,705 being more than double that for the previous year (£246,375). The company is installing plant to increase its monthly output to 40,000 tons. Developments are giving good results but drilling to test the ground under the Broomsassie ore bodies has been suspended.

The tonnage milled by Gold Coast Main Reef Ltd. in the year to June 30, 1950, at 97,994 was some 17,000 less than in the previous year. This was largely due to labour shortage, particularly underground, which has also restricted development. Exploration on the 13th and 15th levels has given encouraging results. The 13th level drive south has exposed a pay shoot extending for 200 ft. averaging 18.99 dwt.

The present monthly output of Amalgamated Banket Areas Ltd. approximates 40-45,000 tons, of which a little more than half is mined from the underground sections and the remainder from the Pepe open-cast surface deposit. Working profit now averages some £20,000 per month. The company is going ahead with the consolidation of its scheme of enlargement following the acquisition last year of the properties of Gold Coast Banket Areas Ltd. and South Banket Areas Ltd. Work is proceeding energetically to increase the present monthly throughput to 70,000 tons.

Marlu Gold Mining Areas Ltd. are now treating 45,000 tons of ore per month, against an average of a little over 34,000 tons per month in 1949. The company's profit for the year to September 30, 1950, was £187,570. The major ore occurrence on the property is a surface deposit mined

by open-cast methods, but underground work is being re-started in order to mine the Marlu sulphide ores and to search for possible new ore bodies.

The Nanwa Gold Mining Co. is now crushing ore and the first output of 94 bullion oz. has been banked.

Kwahu Mines (1925), Ltd. have decided to close down and write off all expenditure on their Siwum concession.

*Alluvial Gold.*—The four dredges of the Bremang Gold Dredging Co. treated 8,438,190 cu. yd. for a recovery of 38,156 oz. of gold; this is 921 oz. more than in the previous year. Operating profit for the nine months to December 31, 1950, amounted to £117,500 from 6,318,830 cu. yd. treated. The average cost per cu. yd. in 1949 was 6.31d. while the recovery per cu. yd. was 2.41 grains. Reserves in 1950 amounted to 46,094,500 cu. yd., averaging 3.12 grains. Negotiations have been concluded for the taking over by the Bremang company from its associated company—Gold Coast Selection Trust—of the latter's Offin and Jimi river gold-bearing areas.

*Diamonds.*—Four companies are now producing diamonds. Exports during the year to March 31, 1950, amounted to 978,384 ct., a decrease of 49,680 ct. on the figure for the previous year. The value—£1,570,523—was, however, £28,427 higher. Of the total output 451,602 ct., worth £762,122, were exported on behalf of Africans operating on their own account. For the previous year African production amounted to 281,799 ct. The remarkable expansion which has taken place in the production of diamonds by Africans will be seen from the fact that in 1935-36, 34,500 ct. valued at £14,500 were won.

At the recent meeting of Consolidated African Selection Trust Ltd. it was announced that, following satisfactory results of tests, a new type of treatment plant had been completed and was in operation on the company's properties.

*Manganese.*—Ore shipped during the year to September 30, 1950, amounted to 768,660 tons. This tonnage represents 606,410 tons of metallurgical ore of 48 per cent plus Grade, 86,134 tons of chemical ore, and 76,116 tons of sintered ore. Production has been increased and is now at the rate of 850,000 tons per annum. In the previous year exports amounted to 657,028 tons valued at £3,006,758.

*Bauxite.*—Exports for 1949-50 were almost identical with those for the previous year, *viz.*, 144,579 tons valued at £274,701. For the nine months to September, 1950, they amounted to 83,094 tons valued at £167,136.

Proposals are being considered for the construction of the Volta River hydro-electric scheme; the capacity of the plant will, it is expected, be 540,000 kW. It is proposed to process bauxite from the deposits at Yenahin, Ashanti, in factories on the banks of the river Volta.

**Sierra Leone**

The number of Africans employed in the mining industry in 1950 at 6,545 was some 200 more than in the previous year.

Output of gold and diamonds for the year to September 30, 1950, increased appreciably over that for 1949—gold from 1,863 f.oz. to 3,186 f.oz., and diamonds from 565,671 ct. to 611,545 ct. On the other hand chromite output fell from 17,153 to 11,068 tons, while exports of platinum ceased altogether. Shipments of iron ore from Marampa in the calendar year 1950 amounted to 1,136,000 tons, as compared with 975,000 tons in 1949.

*Diamonds.*—Sixty-six per cent of the diamonds produced in 1950 were industrials and 34 per cent gemstones.

The prospecting programme of Consolidated African Selection Trust Ltd., is being actively pursued. The adoption of mechanized mining methods has resulted in a marked improvement in the yardage treated. Considerable progress has been made in the company's re-housing plans for their African employees and a new club has been built. Attention is also being paid to the development and improvement of the conditions of the health service, and additional hospital accommodation has been completed.

# Canada

*By Our Own Correspondent*

THE value of the mineral output of Canada during 1950 exceeded $1,000,000,000 for the first time for any one year in the history of the nation. In a period of just ten years, the value of production has more than doubled. In 1939, for instance, the value produced was $475,000,000. Compared with this is the preliminary estimate of $1,100,000,000 for 1950 as prepared for *The Mining Journal*.

**Nickel**

Base metal mining and the production of petroleum commanded special attention throughout the year. Canada's two nickel producing mines, International Nickel Co. of Canada, and Falconbridge Nickel Mines, produced approximately 80 per cent of the world's output of nickel—these two companies producing approximately 257,000,000 lb. valued at $105,000,000, in addition to a very large yield of copper as well as metals of the platinum group. A visit to these mines reveals the evidence of further important expansion in progress, and with ore reserves capable of maintaining enlarged output for a period measured in decades if not actually another half century. So far, the profitable production of nickel in Canada has been confined to the Sudbury mining field of Northern Ontario. However, another probable producer of considerable magnitude appears to be assured—this new mine being located 1,000 miles farther west—at Lynn Lake in the province of Manitoba and owned by Sherritt Gordon Mines. Work on this new mine has so far indicated 10,000,000 tons of ore with an estimated gross value of $145,000,000. Plans call for commencement of production within the next two to three years at a rate of 2,000 tons of ore daily.

**Copper, Lead and Zinc**

Copper output during 1950 exceeded 525,000,000 lb. according to preliminary estimates, and with a value of approximately $123,000,000. With demand far in excess of supply, and with the current price of the metal more than double that which prevailed during World War II, there is an abundant evidence that the mining of copper in Canada during 1951 will exceed even the high rate which prevailed during 1950.

Lead production in 1950 has been estimated at 340,000,000 lb., having a value of $49,000,000. Demand increased toward the close of the year.

Zinc output during 1950 soared to some 620,000,000 lb., having a value of $97,000,000. This metal was low on the ladder of non-ferrous metals not so many years ago, but has now risen to extremely high levels of usefulness, more particularly in making brass, die-casting, galvanizing, etc. The outlook is that the mines of Canada are capable of developing into still greater producers of zinc.

**Gold**

Gold miners met with increasing difficulties during 1950 due to the rising cost of material, supplies, and labour. Yet, despite rising costs and the fixed value of the precious metal, gold produced during the year rose to 4,431,000 oz. with a value of $169,000,000, compared with $148,446,000 in the preceding year. The year closed with the federal government showing serious concern for the welfare of some of the lower grade gold mines. In the opening month of 1951 some consideration is being given to the question of finding ways and means by which the producers of new gold might be permitted to sell their product to the highest bidder—but this development still lies in the realm of uncertainty and mere possibility. One factor looms large in connection with the future of gold, and that is associated with the recent heavy investment of American and Canadian financiers in the stocks and shares of the leading gold producing mines of North America. That trend may or may not hold special significance.

**Iron**

Iron mining, and the prospects of a growing iron and steel industry in Canada, came into sharp focus during the past year. Much attention was directed toward the new iron ranges of Northern Quebec and Labrador. These deposits are to be developed and placed on a producing basis of 10,000,000 tons annually during the next few years. The fact that $200,000,000 has been provided with which to start the big enterprise toward its goal has encouraged widespread publicity. Also, the 400,000,000 tons of high grade iron ore in sight in the new area—and the prospect of this estimate being ultimately doubled or trebled—has reached the "ears" of Washington and may well result in the government of the United States joining with Canada in the development of the St. Lawrence River into a deep sea route from the Atlantic seaboard to the Great Lakes area in the heart of the continent. But, while the iron of Quebec and Labrador monopolized publicity, two other areas in middle Canada showed almost equal promise in point of prospective tonnage and ultimate output. First is the Steep Rock iron area in the westerly part of Northern Ontario now producing at a rate of 1,200,000 tons a year with plans of possibly 10,000,000 tons a year within the next half-dozen years. Second is the current production of 1,000,000 tons a year of sintered iron ore from the Michipicoten mines of Algoma Ore Properties. The siderite ore bodies on this range are estimated at around 500,000,000 tons.

**Oil**

Petroleum discoveries in Western Canada are already capable of producing 50 per cent of this country's requirements. The 1,150-mile pipeline to the head of the Great Lakes has been completed, costing $100,000,000. When navigation opens in April, this oil will find its way by tankers to the refining and industrial centres of Eastern Canada. So far, the known extent of the oil pools in Alberta and possibly extending across Saskatchewan and into Manitoba, has been limited only by the amount of capital available for exploration and the speed with which the search may be carried on. Estimates suggest reserves of at least 1,000,000,000 bbl.

**Impressive Record and Bright Future**

While the record of past achievement associated with the mineral industry of Canada is impressive, yet it is on the outlook for developments in prospect during the years immediately ahead that the eyes of the world should be focused. For never in the history of this country did so many major projects loom across the industrial horizon. The amount of new capital pouring in to new mineral enterprises is now in excess of $200,000,000 annually. This includes aluminium, iron, lead and zinc, nickel and copper, magnesium, cobalt, chromite, titanium, uranium, asbestos, gold and silver —and does not include the further large flow of capital into the development of the oilfields, coal, sulphur, cement, gypsum, mica, etc.

No other year in the history of Canada saw more basic wealth in natural resources revealed than did 1950, and never before did capital display greater desire to participate in development. Likewise, no year ever opened with greater promise of major industrial developments in this country than has 1951.

# Western United States

*By Our Own Correspondent*

DETAILED estimates of mineral production for 1950 are not available at this writing and, for security reasons, may not be released for some time to come. For the country as a whole mineral output, exclusive of mineral fuels, was valued at $3,014,000,000, of which 45 per cent was metallic and 55 per cent non-metallic. This was an increase of 12½ per cent over 1949.

**Prices**

Economic progress, which had moved normally during the first half of 1950, was rudely interrupted by the outbreak of hostilities in Korea. The last half of the year saw stepped up production in mines already operating, reopening of mines closed down during the 1949 era of low prices and increased activity in development. Prices naturally started upwards but producers did their best to keep them from getting out of hand so as to head off "rollbacks" if controls were imposed, which seemed inevitable. The effort was generally successful so that at the end of the year copper was quoted at 24½, lead at 17 and zinc at 17½c., an average increase of approximately 50 per cent during the year. In September Congress passed the Defense Production Act which authorized the President to impose controls at his discretion and shortly thereafter National Production Authority issued an order applying to 50 standard commodities, including 25 non-ferrous metals, which restricted users from stocking them "in excess of reasonable demand."

**Fissionable Minerals**

Fissionable minerals have been in the limelight during the year and the Atomic Energy Commission is offering many inducements to stimulate exploration and production. The most promising district is the "Four Corners Area" where Colorado, Utah, New Mexico and Arizona have a common corner. Possibilities of this area have been known for some time but development has been retarded by the very rugged terrain which made it practically inaccessible. A general development programme which includes $10,000,000 in road construction is now under way and an extensive drilling campaign is being carried on to prove formations that may be favourable to the occurrence of uranium ores. At Grand Junction, adjacent to the Four Corners Area, two mills for the processing of uranium ores are under construction and U.S. Vanadium Corporation has rehabilitated its mill at Uraven, Colorado.

**Gold**

During 1950 production of gold and silver was at its highest point since 1942 and the value of the two metals showed an increase of 20 per cent over 1949 but gold mining is still suffering from the blow dealt in 1942 when all gold mines were closed down. Due to the increased prices of labour and supplies and the fixed price of gold, the mines have been slow in staging a comeback and the industry has not yet approached its former output although some important developments are under way. California retains its place as the leading gold producing state with South Dakota, seat of the Homestake, second. California's leading producers are Yuba Consolidated Goldfields, which operates a fleet of dredges, and Central Eureka. Homestake in 1950 approximated its pre-war production. Nevada and Colorado had the most active developments in gold mining. Nevada's largest mine, Getchell, completed reconstruction and enlargement of its mill and is now treating 1,000 tons daily from its oxide ore body, and at Goldfield Newmont Mining Co. continued active exploration, with satisfactory results. Round Mountain Dredging Corporation started a unique project which involves handling 17,000 tons daily from an immense gold bearing alluvial deposit of a volume of 67,000,000 tons. The Cripple Creek district in Colorado is experiencing a revival due to the completion of the Carlton tunnel and the 1,000 ton Carlton mill. The tunnel has been in operation for two years and affords drainage to several of the mines that had been drowned out in their lower levels and which have now resumed deep development. The mill will treat the ores in the district itself.

**Silver**

Anti-silver forces made another effort to repeal the law fixing the price of domestic silver at 90½c. an oz. Bills were introduced in both houses of Congress but neither was acted on before adjournment. As most of the metal is produced as a by-product of lead, zinc and copper ores a reduction in the price of silver would affect the output of these others. In Nevada a silver revival appears to be under way. Tonopah-Belmont, one of the great producers when Tonopah was a bonanza camp, is being reactivated after a long period of idleness. American Smelting and Refining Co. is diamond drilling a large area north of Tonopah. On the Comstock lode Ophir is drilling to prove ore deposits ignored in the days of the "Big Bonanza."

**Copper**

The suspension of the 2c. duty on copper expired on June 30 and although a bill to restore it passed the House by a large majority it died when Congress adjourned without action by the Senate. The year opened with copper mining in the doldrums due to the depressed prices of 1949 but a marked revival took place after the Korean crisis and production for the year was 20 per cent in excess of 1949. In Arizona, Miami Copper Co. started a $13,000,000 development on its subsidiary, Copper Cities Mining Co., estimated to contain 30,000,000 tons of disseminated chalcocite ore amenable to open pit operation. Phelps-Dodge Corporation has brought its various branches up to full production and has resumed its operation of the New Cornelia smelter. Kennecott Copper Corporation has gone on a seven-day week at its Ray mine in Arizona and at the Hayden smelter and has prepared a considerable portion of its ore body for open pit mining. Its Chino mine in New Mexico has adopted a seven-day schedule and installed a new 126 ft. reverberatory furnace. At Garfield, Utah, Kennecott started its new copper refinery which receives its anodes from the new casting plant of American Smelting and Refining Co., the two plants making western copper producers independent of the refineries on the Atlantic seaboard. In Montana, Anaconda continued development of its Greater Butte project and launched another development, including a 6,000 ft. tunnel, to reopen several of its long idle Butte mines.

**Lead-Zinc**

1950 production of lead and zinc showed small increases, 4 per cent for each, over 1949 output, lead from 410,000 to 427,000 tons and zinc from 590,000 to 615,000 tons. In Idaho, Bunker Hill and Sullivan developed its new block caving project to the point that 300,000 tons are available and production therefrom is at the rate of 1,000 tons daily. This deposit contains 5,000,000 tons of ore by-passed in former operations and a similar block is being developed. Contract has been let for the completion of the deep level tunnel at Leadville, Colorado, which will make available a large tonnage of lead, zinc or manganese ores.

With the defence programme started and expected to extend over an indefinite period there will be an increasing and continued demand for the essential metals. The effect on the mining industry will depend to a considerable extent on the policy the government may adopt with respect to controls, taxes, loans to mines and subsidies for marginal mines.

# Argentina

*By Our Own Correspondent*

SHORTLY before the outbreak of hostilities in Korea the Argentine Government issued a decree on the encouragement of the Mining Industry (May 15, 1950). By this decree the mining industry was declared to be "of national interest" and the government undertook its "planification and orientation." The Argentine Industrial Credit Bank was once more authorized (as it had been many times in the course of these last years) to finance the mining industry in general and come to the assistance of the small miners and co-operative organizations in particular; it can also participate in the financing of new firms and import and distribute mining equipment. As for exports, the Bank may handle those which are not otherwise saleable, while a special list of mining products was published which could be exported without a special licence. Included in this list were up to 300 tons of mica, 500 tons of wolframite and scheelite. The annual report of the Bank, for 1949, was released in December, 1950 only and stressed as a major achievement the discovery of large iron ore deposits in the Sierra Grande in the Rio Negro territory.

The following output figures, all in metric tons, were released recently:—

| | 1947 | 1948 | 1949 | 1950 (5 months) |
|---|---|---|---|---|
| Lead ..... | 35,546 | 33,563 | 27,287 | 12,479 |
| Zinc ..... | 30,980 | 23,496 | 20,849 | 8,240 |
| Tin..... | 178 | 317 | 119 | 71 |
| Silver/Tin | 1,875 | 502 | 655 | 365 |
| Sulphur... | 10,907 | 8,384 | 10,071 | 4,640 |

The following export figures are available from private sources for the first nine months of 1950: raphaelite 2,843 tonnes; mica 307 tonnes; wolfram 218.6 kilos; scheelite 29.4 kilos.

Supplies of domestically mined lead and tin are at the mercy of the black market. The official ceiling price for lead ingots is still Ps.1,750 per tonne while on the basis of the price for the ore (which is not subject to price controls) the corresponding lead price would be at least Ps.4,000. Even I.A.P.I., the official foreign trade agency, has been selling Japanese lead at Ps.2,400 per tonne. As for tin the official price is Ps.7 per kilo while the black market price is Ps.30 and higher.

An increase in lead production may be a result of the Korean development. Private estimates of Argentina's lead production in the first six months of 1950 were 7,335 tons only compared with the official figure of 12,479 tons for five months. Zinc production for six months was privately given as having amounted to 10,300 tons with an early increase expected as a result of the building of a new 10,000 tons smelter in the Chubut territory, and a new zinc-roasting plant near Rosario.

The fuel situation is rapidly approaching some kind of negative climax. Fuel imports dropped from more than 7,000,000 tons in 1948 to 5,700,000 in 1949 and 4,200,000 in the first eight months of 1950—since then, however, difficulties to secure coal are increasing and the import of petroleum products, temporarily encouraged by the granting of credits by the U.S. petroleum companies, is expected to fall off in 1951. Restrictions of the consumption of fuel have been ordered.

Gold deposits are reported to have been found at Hualfin near Agua Dionisio, in the Province of Catamarca.

# Brazil

*By Our Own Correspondent*

PRODUCTION of the principal minerals, except coal, showed further increases in 1950. The following figures represent output in tonnes to September 30: coal, 1,486,836; cement, 1,016,271; steel ingots, 574,541; pig-iron, 519,792; rolled steel products, 435,680; arsenic, 756; gold, 3.031; silver, 0.446.

The national steelworks at Volta Redonda produced 304,436 tonnes of steel ingots by December 31, the maximum output with existing installations. The Export-Import Bank has advanced $U.S.25,000,000, and the company's capital has been raised from £10,000,000 to £35,000,000, in order to increase capacity to 560,000 tonnes. Several private companies are raising capacity, encouraged by high prices and import restrictions. Local steel consumption increased from 380,000 tonnes in 1940 to 850,000 in 1950, and should reach 1,000,000 in 1952.

Exports of iron ore through Victoria from the ex-British Itabira mines increased by 52 per cent to 721,765 tonnes in 1950; 588,253 tonnes went to U.S.A. and 18,491 to U.K. Shipments through Rio from Central Minas Geraes are estimated at 187,523 tonnes chiefly from the mines of Companhia Meridional, a subsidiary of U.S. Steel. Shortage of railway trucks restricted exports, but the Central Railway will spend $U.S.1,000,000 to raise carrying capacity.

Exports of manganese ore are estimated at 153,000 tonnes, mainly from Meridional's mines at Morra da Mina, Minas Geraes. Increased U.S.A. purchases are expected under the Economic Mobilization Plan, in view of Russia's suspension of supplies. Numerous deposits of varying importance exist in Minas Geraes and Bahia. The product of the Urucum mines in Mato Grosso (reserves 33,600,000 tonnes) are only exportable through Argentina, increasing costs. The Amapà beds, discovered in 1946 and provisionally estimated at 20,000,000 tonnes, are being developed by a national company (I.C.O.M.I.), in which Bethlehem Steel owns 49 per cent of the shares. Bulk exportation should begin in 1954, after construction of railway and port.

During 1950 the Department of Mineral Production (D.N.P.M.) began prospecting newly-discovered deposits of cassiterite in the Serra dos Tartarugais, Amapá Territory, and in the Basin of Rio das Mortes and Carandai, Minas Geraes, Brazil's principal known sources of tin. In S. Joao del Rei, where deposits have been worked since 1943, installations for obtaining metallic tin have been modernized and five foundries are now operating. The D.N.P.M. has continued investigating methods for improving Brazilian coal, completed laboratory experiments for extracting sulphur directly from pyrite rejects, and is now studying the application of the process to industry. Other studies relate to the industrialization of the phosphoric bauxite of Gurupi; sintering of Brazilian iron and manganese ores, and localization of radioactive minerals. A Canadian company has been authorized to exploit valuable nickel deposits at S. José de Tocantins.

In 1950, Brazil's first modern refinery began processing 2,500 bbl. of crude at Mataripe from the Bahia wells; work was started on the government's 45,000 bbl. plant to refine imported crude at Santos; on the 10,000 bbl. private refinery at Rio, and on the Santos-S. Paulo oil-duct. A new oil-field, with reserves of 30,000,000 bbl. was discovered in Bahia, and drilling began at Limoeiro, Para, and Carolina, Maranham. Prospecting continues in four other States.

# Bolivia

**By Our Own Correspondent**

BOLIVIA'S economy rests principally on the tin industry and, as it is a high cost producer, generally on a high level of prices for the metal. The announcement of a policy of general rearmament in the United States and increased stockpiling purchases of essential commodities, was bound to improve the outlook. The United States is dependent on Bolivia for its supply of antimony to the extent of at least 33⅓ per cent, and for tin, at any rate in normal times, of some 20 per cent—a percentage which it is expected would rise considerably in wartime. In these circumstances it is significent that Bolivia is now drawing closer to the fundamentally pro-U.S. group of South American Republics on the West coast under the leadership of Chile. Ties with Argentina are at present less strong than three years ago when there was a prospect of large Argentine purchases of tin and antimony, payment to be made in dollars, and of considerable Argentine investments for the development of the Bolivian petroleum industry.

During the first half of the year the tin mines suffered from the current price of the metal, and at one time it is claimed that the Aramayo mines were losing more than 12c. lb. With the development of the war in Korea, the position of the mines improved in line with the advance in tin prices, and during October a *modus vivendi* between the government and the producers, under which the allocation of dollar exchange for tin sales was modified substantially in favour of the mines, further improved prospects and enhanced confidence in the future. However, tin exports again declined substantially and totalled 31,373 tons as compared with 34,662 tons in the previous year, a decline of 3,289 tons.

The three leading producers, Patiño, Hochschild, and Aramayo have said that production could be raised considerably if more money were made available for the exploitation of low-grade ores. Details of production of tin by the various producers since the end of the war are as follows but in 1950 are available only for the first nine months of the year (figures in tons):

| | Patiño | Hochschild | Aramayo | Banco Minero | Total All producers |
|---|---|---|---|---|---|
| 1945 ..... | 19,526 | 11,945 | 2.998 | 3,764 | 43,168 |
| 1946 ..... | 16,624 | 10,196 | 2,915 | 3,443 | 38,222 |
| 1947 ..... | 13,810 | 8,981 | 2,834 | 3,976 | 33,789 |
| 1948 ..... | 17,270 | 8,740 | 2,420 | 5,194 | 37,899 |
| 1949 ..... | 14,374 | 8,704 | 2,176 | 5,747 | 34,662 |
| 1950 (9 months) | 10,521 | 5,031 | 1,546 | 3,770 | 23,158 |

The December exports at 4,156 tons showed a big advance attributed to the improved price and the new exchange allocations, but the late heavy fall in the United States' price, if continued, would, it is claimed, force some of the low-grade producers to suspend operations.

While tin is the mainstay of Bolivian mining, there is a considerable range of other metals in the export list. The figures are as follows in tons:

| | Tungsten | Silver | Antimony | Lead | Copper | Zinc | Gold in f.grs. |
|---|---|---|---|---|---|---|---|
| 1945 ..... | 2,311 | 208 | 5,535 | 9,508 | 6,097 | 20,976 | 98,907 |
| 1946 ..... | 1,272 | 190 | 6,984 | 8,433 | 6,127 | 19,188 | 88,751 |
| 1947 ..... | 1,581 | 194 | 10,857 | 11,310 | 6,241 | 14,612 | 247,440 |
| 1948 ..... | 1,491 | 235 | 12,260 | 25,606 | 6,622 | 21,100 | 125,801 |
| 1949 ..... | 1,526 | 207 | 10,275 | 26,311 | 5,074 | 17,667 | 1,008,252 |
| 1950 | 1,476 | 204 | 8,781 | 31,204 | 4,704 | 19,570 | 54,028 |

# New Zealand

MINING in the Dominion has been marked by a steady decline in metal mining, including gold, and a substantial increase in exploration for, and the mining of coal, together with increasing attention to non-metallic minerals.

**Gold**

New Zealand gold production was 84,874 f.oz., or some 9,000 oz. less than in 1949.

Gold mining has suffered since the beginning of the year, by the stranding of, and the extensive damage to, the dredge of Arahura Gold Dredging Ltd., a dredge with 400,000 cu. yd. monthly capacity. The company has received insurance money, has purchased the dredge and has £168,000 in hand for its rehabilitation. Kanieri Gold Dredging Ltd. earned a profit of £81,070 for its last financial year, but the property now has a life of only two years, so the end of this important group, comprising the Kanieri, Arahura and Barrytown (which ceased work in 1949) is in sight. Hopes that the Kanieri Company might acquire the property of the Taramakau Gold Dredging Co. appear unlikely to be realized. Some six other dredges continue in work. New areas have not been proved to compensate depletion, and the decline of dredging, which is the mainstay of gold mining, must develop fairly rapidly.

The lode mining side is continued by the Martha Gold Mining Co., at Waihi, and Blackwater Mines Ltd. The former company was on the verge of closing down when the increased price of gold, following the devaluation of sterling, made possible the working of some 170,000 tons of ore, dependent, however, on sufficient labour being available. This has been the case during 1950. Blackwater Mines have produced at the rate of 22,000 tons of ore per year, work being hampered by a collapse in the South shaft. Development was restricted by the financial position and by shortage of labour. Developments at No. 16 (the lowest level) have been good, and have disclosed higher than average ore. As reserves at Waihi are limited, it seems that Blackwater will be the hope of New Zealand lode mining.

**Other Minerals**

Some attention has been given to exploration for lead and copper, but developments have been unimportant.

The Dominion Government has given considerable effort to examination of coal resources, and their proving by drilling. There has been marked development in open-cut coal mining, and production from all mines is close to 3,000,000 tons per year. About 25 per cent of the production comes from open-cut mines.

In non-metallic minerals, limestone for agricultural purposes has been extensively mined, and serpentine has contributed a substantial tonnage.

Other than in coal, there have been no mineral discoveries of importance in the Dominion during the year, and reliance for maintenance of output rests on the existing mines.

# Australia

*By Our Own Correspondent*

METAL and mineral production, in the year just closed, reached a high level on the basis of the realization value; but in terms of tons and ounces, which form the true basis, there has been but small advance on the achievements of 1949. The year's progress and the future outlook are rather disturbing, for the country relies entirely on the old mines, which are increasing in depth, and are being pressed for greater output. There have been no new discoveries despite intensive work by the large organizations, Western Mining Corporation, North Broken Hill, Broken Hill South, Zinc Corporation, Electrolytic Zinc and Mount Isa, all of which have spent large sums on exploration. Abandoned mines have been investigated; many have been rejected; some will receive further examination, and some are in the process of testing.

The work of exploration continues largely in the hands of large organizations. Much money might be contributed by smaller investors, but there is effective discouragement in taxation; dividends from base metals are taxable to the extent of 66⅔ per cent, gold alone being exempt; one-third, only, of calls paid to mining companies is allowed as a taxation deduction; the wasting nature of the asset continues to be ignored; prices of certain base metals are pegged much below the overseas equivalent; labour supply is totally inadequate, and its cost has continued to rise naturally influencing that of all plant and supplies, deliveries of which are long-delayed and uncertain. All these factors are effective deterrents to enterprise.

### Domestic Price for Lead and Zinc

There has been some improvement in the fixed price of metals for Australian consumption. For a number of years, commencing in the war period, lead and zinc for local use, were fixed at £A22 per ton, well below the cost of production; this price was ultimately raised to £A45 per ton, or just about the, then, production cost level; a recent increase has raised the price to £A65 per ton of metal, but wages have risen, and hours have been reduced, so that profits depend upon the balance of output which can be sold overseas. It has been stated that Electrolytic Zinc Co., on the price aspect, subsidizes Australian zinc consumers to the extent of £A2,500,000 per year. Lead producing companies are in a comparable position. The price of copper has recently been increased to £A230 per ton; tin has been advanced from £A740 per ton to the producer, to £A.840, despite the fact that Australian parity overseas approximates £A1,600, and the country's deficiency has to be met at that price. In an effort to assist the industry, Commonwealth and State Mines Departments are providing geological and geophysical surveys, and other aid, but neither such help nor increased metal prices can be of any assistance except to established companies unless labour can be made available for new enterprises, and some encouragement be given to young companies to face the exorbitant costs of exploration and preparation.

### Output of Metals

Gold output by the Commonwealth for the year cannot yet be computed, but for 11 months ended November 30, was 787,206 f.oz., or 29,054 oz. less than for the corresponding period of 1949. Production in New South Wales for the full year, 1950, was 43,028 f.oz. compared with 51,793 oz. in the previous year. Western Australian production was 606,172 f.oz. compared with 644,252 oz. Gold production in Victoria for 1950 was 59,487 f.oz., or 8,939 oz. lower than in the previous year.

In base metals there was a slight increase in lead and zinc at Broken Hill, but output at Mount Isa fell. Production of zinc metal has risen and Electrolytic Zinc Co.'s output for their financial year was 83,811 tons—a record. Mount Lyell's copper production was better, helped by greater tonnage of ore mined and improved coke supply; new open-cut mining plant is expected, and tonnage of ore mined will increase. Mount Isa Mines, facing continuous difficulties in supply, has progressed with construction of the copper milling section, and the smelter, which will ultimately contribute 16,000 tons of copper per annum.

Mount Morgan is improving the open-cut mining plant and has continued exploration in the Sugarloaf section, which appears likely to add some 10,000,000 tons of ore to reserves on present indications. At Cobar, New South Wales, drilling is proceeding, testing for repetitions of the copper mineralization, and there has been some encouragement to date. The copper output was 13,552 tons.

Disabilities have prevented small companies coming into the field to take advantage of high prices for lead and zinc by re-opening old mines. North Broken Hill and Broken Hill South are pushing on with development on the Zeehan field, Tasmania, and a new lode at a depth of 300 ft. has been reported. In the same district, the Montana company is erecting a treatment plant of 25,000 tons annual capacity.

### Progress at Broken Hill

During the past year at Broken Hill, Zinc Corporation is advancing its long-range programme for increased output, and New Broken Hill Consolidated has made good progress in the erection of the power house and the milling plant. Output of the former now approximates 39,000 and of the latter, 18,000 tons of ore monthly. The most interesting event at North Broken Hill was the intersection of the top of the southern ore body by diamond drilling at a depth of 3,600 ft. Labour position on the field has improved, following the opening of the union books to outside labour, to the extent of 500 men; an additional 1,000 men will be required within two years.

Principal tin producers are Aberfoyle, Tasmania, with increasing output, Renison Associated in the same State, with possibilities, and Tableland Tin, in Queensland, which has now secured an additional area, which will extend the life of the mine a further 12 years. Other possiblities are, meanwhile, neglected. The year's output was 2,013 tons. Tungsten production is mainly from King Island Scheelite, which maintains large ore reserves, and has slightly increased output.

### Repetitions of Golden Mile Formations

Outstanding in the gold mining field is the work of Great Western Consolidated, which is equipping a promising group of mines in Western Australia. At Kalgoorlie, much interest and potential importance attaches to the exploration to be commenced for repetitions of the Golden Mile formations to the south and east of the existing mines, which is a well-founded geological conception.

Lack of coal and steel, through union restriction of coal production, continues to restrict industry very seriously. The output of steel is still little better than 66 per cent of works capacity. At that rate of output, production is 50 per cent of demand.

Work has been commenced on erection of plant for the aluminium project at Bell Bay, on the Tamar River, Tasmania, but the call for skilled labour is seriously affecting other construction projects less favourably situated with regard to living and other conditions.

# Malaya

*By Our Own Correspondent*

THE year under review will probably be long remembered as one of the most complex in the history of Malayan mining, particularly as regards its major tin-producing section.

The first new year spot quotations for the metal opened around the £600 mark and remained there, with only minor fluctuations, until the beginning of July. A good deal was heard during this period of the "burdensome surplus of production." It is interesting to note that this metal price was well below the previous fixed price of $1.03 per lb. calculated at the revalued sterling rate. There can be little doubt that the price was partly held down by the disposal of the Ministry of Supply stockpile, the sale of which must, however, have added a tidy sum to past profits made from tin in this quarter.

From Monday July 3 the market firmed noticeably and prices started climbing, at times spectacularly. By mid-August £800 had been well exceeded. A sharp drop was followed by further rises and with brief recessions a peak of £1,300 was reached in November. The year ended steadily at not far short of double the opening quotation.

**Brakes on Production**

The increase in prices has certainly provided an incentive to the maintenance of the 1949 production level. The comparatively small actual increase in output to 57,722 tons of metal from 54,910 tons, therefore merits examination. The total number of mines producing had risen at year end to 733 from 686. Dredging units had increased by 4 to 80 and gravel-pump mines, the next biggest producer group, from 518 units to 561. Outputs, however, were at a peak in May (5,198 tons from 697 units against 4,736 tons in December) when the metal price was much higher. The average for the last quarter was 4,713 tons/month.

To some extent the modest increase in production against the increased number of producers can be ascribed to the working of lower grade ground made payable by increased realization prices. The major reasons, however, lie in other factors. Malaya generally, and Selangor particularly, have suffered from an electric power shortage since the re-occupation. The breakdown of one of the main generating units of the Kuala Lumpur Power Station on October 1 caused a further substantial drop in permitted running time for a substantial number of producers. The first half of the new Connaught Bridge Station may come into action by the end of 1952. The second half, giving a total capacity of 70,000 kW., lags still further behind schedule. The reason given for the delay is non-arrival of plant for the first half and lack of finance for the other. It is ironic to reflect here that Britain has in the same period found it possible to export a reputed million kW. of equipment behind the iron curtain.

A further reason for lack of production lies in the emergency which continued unabated during the period under review. Whilst comparatively few mines suffered serious damage by attacks, not many gravel-pump mines worked at night.

Yet another factor lies in a shortage, particularly in unskilled labour. This has been brought about principally by the drift of personnel to rubber small-holdings which offer fantastic wages to tap in on the rubber boom. The relative statistics 47,244 men for 733 tin mining units against 46,993 for 686 in 1949 do not in themselves give the true position as mechanization is gaining ground. The pinch is felt more in the shortage of contract labour for ancillary works—the full effect is yet to come.

Reference has already been made to working of lower grade ground. Whilst this is highly desirable it must not be allowed to obscure the acute shortage of new reserves. Any substantial drop in the metal price would close down the mines now working in marginal value ground. No statistics are available at date of writing regarding the number of prospecting permits currently valid or the acreage newly converted to mining title. It is common knowledge however that the problem is receiving insufficient attention from the authorities concerned with land matters.

In the realm of international negotiation it suffices to record here that the Tin Study Group re-convened early in the year and that an international tin conference was held at Geneva in October to discuss further the terms for a restriction agreement. The failure of the latter meeting has been fully reported elsewhere.

**Taxation**

The Malayan Government's financial estimates for revenue from tin export duty were handsomely exceeded. The record sum of $50,932,569 (against $38,061,651 for 1949) was realized. It must be clearly understood that this figure represents only the automatic royalty on all ore won, whether the mine in question is operating at a profit or not. Company taxation at a flat rate of 20 per cent—raised to 30 per cent since year end—is levied in addition on profits. Information on the amount collected is not available but it is obviously a substantial sum. To this must be added again sundry revenue from such sources as quit rents, prospecting and conversions to mining title, the fees for which have been revised upwards in most states.

After many delays the War Damage Commission was established and, as far as the tin mining industry is concerned, has made good progress. Awards have in quite a number of cases already been made known to claimants. This progress has in turn clarified the Rehabilitation Loan position with the result that the directors of many companies have been able to recommend a return to the dividend paying list and more liberal distributions, which are tending to average out the "nil" war years.

**Other Mineral Production**

Other mining in Malaya remains of subsidiary importance in relation to tin.

It is pleasant to record that the Dungun Iron Mine produced just under half a million tons (8,390 tons in 1949) and that raw gold reached 18,436 oz (13,601 oz.). Coal production showed a slight increase from 386,898 tons to 415,777 tons but the latter figure is still far short of domestic requirements. A workmen's go-slow policy is said to be one of the major limiting factors.

It is a great pity that wolfram mining, which once ran into some hundreds of tons per year, has virtually ceased. Only 5.35 tons are recorded in the official statistics and this small quantity probably derives as a by-product of tin mining. Quite a number of promising deposits are known to exist. Low pre-war prices compared to tin and long periods of small demand are probably responsible for the lack of interest by the usually enterprising Chinese mining community. Granted that most of the potential producers lie in remote and unsafe areas it is still to be hoped that the present high prices will provide the incentive for development.

Ilmenite, obtained as a by-product from tin-ore washing, again shows an increase of exports to 24,915 tons from 19,716 tons.

There was in addition a small output of scheelite (10 tons against 30), 1,435 tons of China clay (1,173 tons) and an isolated parcel of 8 tons of columbite obtained as a by-product from a tin mine.

# Japan

By V. WOLPERT

THE post-War recovery of Japanese economy continued to make good progress during 1950. According to preliminary figures the index of the total industrial production rose to 93 per cent in 1950, as against 77.2 per cent in 1949, the production level of 1932-36 being taken as 100 per cent. It is noteworthy that the index of mining production which in 1949 already surpassed the 1932-36 level by 4 per cent, reached a new peak of 108 per cent of the pre-war level in 1950.

During the second half of 1950 the international political situation in general and the war in Korea in particular has greatly influenced the development of Japanese industry, and for the first time since the end of the war Japan was able to achieve a favourable trade balance throughout the second half of 1950. During 1949 the monthly average adverse trade balance amounted to $U.S.32,599,000 (imports being 75.1 and exports $U.S.42,500,000). By gradual expansion of exports the adverse balance dropped to $U.S.1,000,000 in June, while since then the trade balance has been favourable.

## Mining Industry

Coal production during 1950 remained at approximately the same level as in 1949, namely of 3,100,000 tonnes monthly, but has shown an increase up to 3,500,000 tonnes in November (3,276,000 tonnes in November, 1949). The main feature of the year was an increase of productivity. The number of miners dropped as against 1949 but the average output per underground worker per month rose to 13.4 tons per month during the first half of 1950 as compared with 11.3 tons during the corresponding period of 1949. According to a recent investigation made by the Economic Stabilization Board, the Japanese coal industry wants to import machinery worth $U.S.10,000,000 to modernize the industry, while the total requirements made by the key industries of the country for the imports of machinery amount to $U.S.78,000,000, including $U.S.22,000,000 worth machinery required by the steel industry.

According to the latest estimates the output of iron ore has risen from a monthly average of 64,274 tonnes (32,757 tonnes of metal content) in 1949, by nearly 10 per cent to over 70,000 tons (37,000 tonnes metal content) in 1950. The output of crude petroleum rose from a monthly average of 18,129 k.l. in 1949, to approximately 27,000k.l. monthly in 1950.

The following table shows the *monthly* average production of the non-ferrous mining and metallurgical industries for the last two years, clearly illustrating the steady recovery of Japan's industry. Only the production of tin and mercury show a certain decrease.

| | 1948 (tonnes) | 1949 (tonnes) | 1950† (tonnes) |
|---|---|---|---|
| Copper in Ore | 2,100 | 2,700 | 3,200 |
| Zinc in Ore | 2,800 | 3,700 | 4,200 |
| Lead in Ore | 600 | 800 | 900 |
| Refined Copper | 4,500 | 6,200 | 6,900 |
| Refined Lead | 900 | 1,000 | 1,300 |
| Refined Zinc | 1,800 | 2,700 | 4,000 |
| Aluminium: | | | |
| Primary | 600 | 1,800 | 2,000 |
| Secondary* | 200 | 200 | 300 |
| Tin | 13 | 40.4 | 36.6 |
| Mercury | 4.9 | 7.1 | 4.1 |
| Antimony | 15.1 | 27.4 | 54.6 |

* Remelted and aluminium-alloy scrap/ingot. † Estimated

## Japan's Imports of Coking Coal and Iron Ore

In the past Japan's basic industries were built up on raw materials imported from China. Since the Occupation, however, Japan has largely been weaned from China as a source of supply for these raw materials. Coking coal has been imported in large quantities from Canada and the U.S.A., while iron ore has been imported from Malaya, the Philippines and India. Japan's new dollar reserves will enable her to import, at least for the time being, coking coal and iron ore from non-Chinese sources, and the present high prices of finished steel products will enable her to pay higher transport charges.

By the end of 1950 the Chinese had not yet stopped supplying Kailan coal, of which the Japanese Government have budgeted for 1,000,000 tonnes during the fiscal year ending March 31, 1951, and it is reported that 350,000 tonnes of this total were delivered by the end of 1950. Being prepared for the stoppage of further deliveries from China, the Japanese authorities have taken steps to replace the 1,500,000 tonnes of Kailan coal, which they planned to import during the fiscal year, starting April 1, 1951, by imports of American coal. A tentative import contract for the supply of over 800,000 tonnes of iron ore from Malaya during 1951 was recently concluded.

## Iron and Steel Industry

The following table shows the remarkable increase (in tonnes) of production achieved by this industry:

| Calendar Year | Pig Iron Production | Open Hearth Production | Rolled Steel Production |
|---|---|---|---|
| 1946 | 140,010 | 136,312 | 359,405 |
| 1948 | 686,279 | 1,160,635 | 1,112,852 |
| 1949 | 1,370,938 | 2,428,001 | 2,046,616 |
| 1950 (est.) | 1,974,141 | 3,867,811 | 3,255,842 |

Japanese steel industrialists viewed with concern the abolition of Government subsidies for steel which was gradually carried out between April 1949 and January 1950, and for finished steel (abolished in July 1950). Subsidies for pig iron are still being paid, but may be abolished during 1951. The situation changed, however, with the outbreak of the war in Korea, and the prospects for the industry are regarded as bright. The rearmament programme of the Western countries is bound to benefit Japan's steel industry. The U.S.A. have already placed orders for Japanese steel. The possibility of Japan's rearmament is increasing steadily. In addition, Japan hopes that the British Commonwealth plans to develop the economy of South East Asian countries will result in orders for the Japanese heavy industries.

The present annual production capacity of Japan is estimated as: pig iron 5,900,000 tonnes, steel ingots 11,600,000 tonnes, finished steel 10,400,000 tonnes.

To attain these figures is, at least at present, out of question. But the Japanese authorities being well aware of favourable prospects for Japan's iron and steel industry and of the importance of an increased production of iron and steel industry for the whole economy of their country have proposed the following production targets for 1951: pig iron 3,600,000 tonnes, steel ingots 6,100,000 tonnes, finished steel 4,000,000 tonnes, re-rolled iron 2,900,000 tonnes.

It is estimated that following quantities of raw materials will be necessary to fulfill the plan: 5,500,000 tonnes of iron ore, 5,800,000 tonnes of coking coal and 5,300,000 tonnes of scrap iron. The execution of this plan would mean an increase of indigenous mining activities and an increase of imports, the latter would amount to 3,800,000 tonnes of iron ore, 2,100,000 tonnes of coking coal, and 600,000 tonnes of scrap iron.

# India *By Our Own Correspondent*

THE year 1950 has seen an increased production in India of a number of important minerals such as mica and coal. In the case of certain other minerals like aluminium and copper, which are produced in smaller quantities, the output has more or less been the same as in 1949.

India occupies an area of about 1,000,000 square miles, extending from the tropics well into the temperate zone. Though it has been a well-populated country for many centuries, geologists have played an important part in the discovery and development of its mineral deposits only during the last 100 years. In the earlier years considerable attention was devoted to the occurrence and distribution of the coal deposits. Attention was given to other mineral deposits in subsequent years, some of the most important being mica, manganese, chromite, bauxite and iron ore.

India has important resources in iron and certain auxiliary materials useful for the iron ore industry. These deposits are fairly widely distributed. The country is also fairly well endowed with coal, though the variety known as coking coal, useful for metallurgical operations, is found in rather restricted quantities.

India has reserves sufficient for her needs in manganese ore, chromite, bauxite, magnesite, various types of clays, abrasive materials, paint pigments, refractories, etc. There are, however, certain serious deficiencies, the most important of which are copper, lead, tin, platinum, nickel, cobalt, molybdenum, tungsten, mercury, petroleum, silver, graphite, potash and fluorspar.

The current annual mineral production of India is valued at about Rs.750,000,000. This is probably a moderate estimate, being the value given for the calculation of royalty at the pitheads. The market value will, of course, be greater.

## Coal and Steel

Coal raisings in India in 1950 went up to 32,000,000 tons compared with 31,000,000 tons in 1949. The country's entire requirements of coke were met in 1950 from the Indian collieries.

India's steel production in 1950 was 986,000 tons (920,000 tons in 1949). Further expansion in production is indicated for this year and the output is expected to exceed 1,000,000 tons.

## Mica

India is the most important mica producing country in the world. She is supplying about 80 per cent of the world's requirements of this important mineral and, incidentally, mica is one of the principal dollar earning materials of India.

In 1950, India exported 733 tons of block mica valued at Rs.9,615,791; a total of 13,974 tons of mica splittings valued at Rs.87,827,508; and 6,135 tons of mica scrap valued at Rs.5,486,213.

## Manganese

Nature has favoured India with very large manganese deposits. In 1950, she exported 206,912 tons of manganese ore valued at Rs.19,289,208. Manganese ore deposits have been mined in many parts of India, the most important being in certain areas in Madhya Pradesh. Other areas in which manganese ore is found are Bihar, Bombay, Orissa, Madras and Mysore. According to Dr. W. D. West, lately director of the Geological Survey of India, total resources of first-grade manganese ore in the principal mines of Madhya Pradesh are about 10,500,000 tons and of second-grade ore about 3,000,000 tons.

## Gold

Gold output during the year amounted to around 189,000 oz., virtually the whole of this output coming from the Kolar goldfield.

## Other Mineral Production

Regarding the other important minerals, in 1950 India exported 711 tons of bauxite valued at Rs.42,557; 11,831 tons of barytes valued at Rs.1,163,455; 31,018 tons of kyanite valued at Rs.4,755,054; 22,590 tons of magnesite valued at Rs.2,831,512; 895 tons of silimanite valued at Rs.185,126; and 840 tons of aluminium valued at Rs.4,461,972.

The production of most of these minerals is much more than the export figures indicate. For instance, India in 1950 produced 3,591 tons of aluminium. India also produced last year 381 tons of antimony.

Valuable quantities of atomic energy minerals, such as uranium, thorium, beryl and monazite, were mined in India in 1950. These ore-bearing belts have been found in various parts of the country. Experimental research on these ores and methods of their commercial utilization are being conducted in special laboratories and factories.

The cement production of India in 1950 was 2,700,000 tons against the production of 2,000,000 tons in 1949, representing an increase of 28.5 per cent over the 1949 production.

India also produced 70,700,000 maunds of salt in 1950 as compared with 55,600,000 in 1949. India has thus achieved more than self-sufficiency in salt.

## India's Deficit Minerals

Regarding India's deficit minerals, she produced about 6,000 tons of copper in 1950, which was only about 15 per cent of her normal requirements. Copper deposits are found in certain areas in Sikkim, Uttar Pradesh, Rajasthan, Bihar, Madhya Pradesh, Madras and Mysore.

Lead and zinc deposits are found in Rajasthan, Bihar and Madras, but much more development work needs to be done on these deposits as their full extent and reserves are not known.

Some occurrences of tin are known in Bihar, but investigations have not been carried out to the point at which it will be known definitely whether deposits are economically workable or not.

India is definitely poor in nickel, cobalt, tungsten and molybdenum. A little cobalt is known to occur with the copper ores of Jaipur, and nickel and cobalt ores in workable deposits in Nepal. Two small deposits of tungsten have been worked, one in Bihar and the other in Madhya Pradesh. Molybdenum has been found in South India.

The only petroleum producing area in India is Upper Assam. Countries which are deficient in petroleum have made use of coal for the production of synthetic motor fuel. In India, too, the matter has been examined and steps are being taken to erect a plant in the Raniganj coalfields to manufacture 100,000 tons of synthetic petrol a year in the first instance.

India produces small quantities of saltpetre. The salt deposits of Rajasthan do not seem to contain appreciable quantities of potassium salts.

With regard to fluorspar or fluorite, one or two small deposits are known in India. Sulphur constitutes one of the most important mineral deficiencies in India. A few deposits of pyrites are also known to occur in different parts of India.

Generally speaking, the mineral production record of India in 1950 was not really satisfactory, for if in some sections there was an increase, there was a marked decline in others.

# Ceylon

*By Our Own Correspondent*

GRAPHITE is the principal mineral mined in Ceylon. It was expected during the latter part of 1950 that the Korean war would push the price of graphite and encourage graphite mining in the island. But this did not materialize. Graphite, however, continued to be the most important mining industry in Ceylon although it showed no signs of improvement during the year. United States purchases, however, recorded a very sharp rise during 1950. From the position of third biggest importer of Ceylon graphite in 1949, the United States of America displaced the United Kingdom to become the biggest buyer in 1950. Purchases by the United States up to November, 1950, totalled over 100,000 cwt., which was more than double her purchases during the whole of 1949.

The volume of purchases by the United Kingdom of Ceylon graphite in 1950 has been roughly the same as in 1949, when she took 42 per cent of Ceylon's exports of graphite as against 22 per cent by Japan and 20 per cent by the United States of America. An interesting feature of the graphite trade of Ceylon in 1950 has been the complete disappearance of Japan as an importer of Ceylon graphite. Trade figures also indicate a marked stepping up of exports of Ceylon graphite to Italy. Other countries which took sizable quantities of Ceylon graphite in 1950 were Australia and India.

The total quantity of graphite exported from Ceylon in 1950 was 12,844 tons valued at Rs.6,222,137. The quantity exported showed a slight improvement on the previous year's exports but the average price was lower. The United States of America and the United Kingdom together took 83 per cent of the total exports from the island. The United States of America imported 44 per cent and the United Kingdom 39 per cent of the island's output.

**Mica.**—Mica is another important mineral mined in Ceylon, but the industry has been in a decadent state for several years. No mica was exported during 1950. Although deposits of phlogophite mica are common in the hill country of Ceylon, the deposits are irregular, and not important producers of sheet mica. In the past generally, and last year specially, production has been negligible and confined to the lower grades of mica.

**Ilmenite, Rutile and Zircon.**—These minerals are also found in Ceylon in fairly workable quantities. The Government of Ceylon are, therefore, going ahead with a plan for setting up a beach minerals plant for the refining of beach mineral sands. Extensive deposits of these sands are found at Pulmodai on the north-east coast of Ceylon. The chief product of this plant will be ilmenite with appreciable amounts of rutile and zircon as by-products.

**Gem Mining.**—Ceylon has been famous for her gems from time immemorial. Precious and semi-precious stones in a large variety are found in the island, principally in the alluvial gravels of the Ratnapura district and the south-west sector of the island. The most important of these are sapphire and ruby; chrysoberyl, including cat's eye and the rare stone alexandrite, beryl; and semi-precious stones such as topaz, spinel, garnet, zircon, tourmaline and the gem varieties of quartz.

**Other Minerals.**—Other minerals of Ceylon include kaolin, quartz and felspar. There was a small production of these minerals in 1950, chiefly for the local ceramic industry.

# Spain

*By Our Own Correspondent*

THE anticipation expressed in last year's *Review* of progressive improvement in the Spanish mining industry for the next few years has been fully confirmed by the results of 1950. This is sufficiently illustrated by the following table of the production of basic minerals and metals (all figures in tonnes):

| | 1949 | 1950 | | 1949 | 1950 |
|---|---|---|---|---|---|
| Iron Ore | 2,644,419 | 2,995,573 | Potash | 690,000 | 1,003,788 |
| Coal ... | 11,882,142 | 12,378,052 | Lead ... | 27,694 | 39,456 |
| Pyrites | 1,342,146 | 1,464,321 | Zinc ... | 19,574 | 21,264 |

These results have been achieved with antiquated plant, which it has been difficult to replace under a regime of restricted supply, which was only lifted towards the end of the year, and obliged mining and smelting plants in many instances to work to only half their capacity.

**Lead**

It is in the production of this metal that the most striking results have been shown. There has been a huge development in the Spanish lead industry embracing an area comprising Cartagena, Cabo de Gata (Almeria) and Cordoba in the south, and Santander in the north. As the new flotation plants are not yet in operation, it may take not less than two years to secure the full yield.

Nine lead-smelting plants are already operating: La Tortilla (Linares), Santa Lucia (Cartagena), both controlled by Peñarroya; La Cruz (Linares); Los Guindos (Málaga); El Priorato (Tarragona); Hinojedo (Santander); and Capuchinos (Guipúzcoa), both belonging to the Real Compañia Asturiana; Minas e Industrias Pirenaicas (Lérida); and Industrias Reunidas (Bilbao). On the basis of an anticipated annual output of 48,000 tonnes and a domestic consumption of 20,000 tonnes, a big exportable surplus emerges.

**Zinc**

The Real Compañia Asturiana, the only Spanish zinc producer, is increasing its output of mixed ores in Reocin, Florida (Santander) and Rentería (Guipúzcoa). The production of concentrates has risen from 81,455 tonnes in 1949 to 99,665 tonnes in 1950. Roasted and crude blende was exported as follows: U.S. 27,695 tonnes, Norway 15,648 tonnes, France 15,356 tonnes, Belgium 2,987 tonnes.

**Iron Ore**

In addition to the production from native ores, 810,380 tonnes of iron ore were produced in the Moroccan Protectorate, and 944,835 tonnes were exported. Spanish exports for the first ten months of the year included 620,000 tonnes to Great Britain.

**Quicksilver**

Last year's production by Almadén was between 118,000 and 120,000 flasks, thanks to the foresight of the technical staff, the high metal price coincided with the full flood of production both from mines and distillation plants, and in consequence, Almadén is dominating the world quicksilver market for the first time in its long history.

**Tin**

Production in the first ten months of the year was approximately 2,577 tonnes of concentrates with metal reported as 1,539 tonnes. It is impossible that such figures represent the real output of the mines or smelters. The high prices may have brought out some hidden stocks or Spain possessed superior attractions for Portuguese ores.

**Wolfram**

Production in the first ten months was 638,769 kilos, but November and December probably considerably increased the total. Anyhow, the tone of the wolfram market has not reflected the exorbitant prices abroad.

# Portugal

*By Our Own Correspondent*

THE most outstanding features of the period under review are the differences in price between January and December and the discrepancy between the production and export figures. Regarding the former, the opening price per l.ton unit, c.i.f. U.K. port for wolfram ore was about 82s., the closing figure being 380s. to 395s. Production of wolfram concentrates during the first eleven months of the year amounted to 1,941 tonnes. Tin concentrates are reported at 974 tonnes for the same period and production of cupreous pyrites at 557,545 tonnes. Exports for the whole year are given below, all figures being in tonnes:

| Exports | 1950 | 1949 |
|---|---|---|
| Wolfram Concentrates | 3,206 | 3,591 |
| Tin Concentrates ..... | 1,175 | 1,233 |
| Tin Metal ..... | 3.27 | |
| Cu. Pyrites..... | 497,223 | 344,836 |
| Manganese Ore ..... | 2,408 | |
| White Arsenic ..... | 1,245 | |

In 1950, U.K. took 2,472 tonnes of wolfram and 1,107 tonnes of tin concentrates. Germany took 436 tonnes of wolfram, other countries 298 tonnes of wolfram. U.S.A. took 49 tonnes of tin concentrates, Spain 19 tonnes. The 3 tonnes of tin metal went to the Portuguese Colonies.

It is notable that there is a big discrepancy between the production and export figures for wolfram and tin. Even if the production figures for WO3 for December 1950, should reach 300 tons, the difference will still be almost 1,000 tons. No secret is made of the fact that a lot of Spanish wolfram is coming into the country, just as a lot of tin ore is going to Spain, but that such a large tonnage should have found its way over the border comes as a surprise.

As was inevitable, the old war period mentality again came to the surface. The principal deviation from war-time conditions was found in the fact that, from 1940 to 1945, everybody was making money, whereas last year found everybody losing it. This resulted in very many new recruits joining up as mineral exporters and dealers, posing as agents for important foreign buyers, unlimited credits, etc. That these newcomers in no way added lustre to an already tarnished service sheet is too well known to buyers abroad to require special mention.

**High Price Brings in Tributes**

Your correspondent has mentioned more than once that the main source of output for wolfram and tin ores is the tributer and not the concession owner. Provided that the price per kilo for the crudely washed concentrates collected and sold by the tributer is high enough to make collecting worth while, thousands of workers on the land, all experts in such work, are ready to exploit the localities known to them from war times as holding mineral. Such a price was reached when the market quotation abroad touched the 350s. per unit figure. At that point, exporters here would have welcomed a joint move on the part of the consuming countries towards fixing a ceiling price, which would have been a guarantee of stability in quotations and distribution of highly strategic material.

England maintains her position as by far the largest importer of Portuguese wolfram and tin ores, as can be seen by the accompanying figures. Last year saw the first shipments of manganese ore to U.S.A. and an increase in the sale of white arsenic. It will be noted that the total exports of tin concentrates reached 1,175 tonnes and that the production is given officially as 974; yet it is no secret that very considerable quantities of both ore and metal are being sent to Spain, where the shortage is acute.

# Norway

*By Our Own Correspondent*

AT the date of writing there is no official information available from the mines and not much statistical data from Government sources. I have, however, through my connection with the industry and a great deal of hard work, collected the material information contained in this review. The Monthly Bulletin of the Norwegian Central Bureau of Statistics contains output figures for the year, and to these I have added production figures for the peak year, 1938, and also for 1949 for comparison. These aggregates are as follows, in metric tons:

| | 1938 | 1949 | 1950 |
|---|---|---|---|
| Iron ore and titaniferrous ironstone | 1,474,478 | 374,303 | 403,575 |
| Copper ore and concentrates... ... | 35,105 | 21,870 | 22,622 |
| Molybdenite ... | 775 | 127.8 | 114.4 |
| Lead and zinc ore... | 15,089 | 11,287 | 10,587 |
| Iron pyrites ... | 1,027,776 | 774,762 | 749,363 |
| Sulphur ... ... | 110,846 | 81,184 | 96,170 |

The widespread devastation in the mining districts due to the war has now been substantially overcome, and fairly good results, as compared with 1949, are now apparent.

**Iron Ore Group**

Sydvaranger with the aid of Marshall funds is on its way to realize its reconstruction programme of diamond drilling, overburden removal and of blasting waste rock to open up underlying ore bodies. The mining at first will be confined to opencast working, and it is expected that production plants will be available for half the projected output by the end of 1951 and for the full schedule at the end of 1952. Pre-war output was about 1,000,000 tons of shipping products. The company has been able to secure the world's heaviest ore-crusher built by the Nordberg Manufacturing Co., of Milwaukee.

The Rana Co. continued its survey of the iron ore fields in Dunderlandsdalen. Seventy-two diamond drill holes have been put down, aggregating 11,286 metres. The known ore reserves have been greatly increased through this work. The E.C.A. has granted Kr.850,000 to further prospecting. Most of the Dunderlandsdalen workings were abandoned after the war, though intensive prospecting has been carried out in the State mines. These low-grade ores can be economically utilized only on a large scale.

Rödsand produced about 37,600 (37,700 in 1949) tonnes of high-grade magnetite-slig containing vanadium, and 10,000 tonnes of road and foundry materials, slightly more than in the previous year.

Fosdalen produced about 213,000 (192,000 in 1949) tonnes high-grade magnetite-slig and 10,000 tonnes of flotation pyrites (6,000 in 1949).

The Titania Co. produced about 100,000 tonnes (99,000) of ilmenite concentrates containing 35.59 per cent Fe. and 43.92 per cent $TiO_2$ besides 21,000 tonnes (19,600) of magnetite concentrates going 66.03 per cent Fe., and 2.73 per cent $TiO_2$.

Söstestad produced 25,000 tonnes of magnetite and haematite going 56.8 per cent Fe., and 1.26 per cent P.

**Pyrites Ore Group**

Travelling from north to south:—the Björkaasen output was 62,000 tonnes (56,000) of iron pyrites; 1,250 (900) tonnes of copper concentrates; 250 (450) tonnes of zinc concentrates. This showed some increase on the previous year and of course considerable advance in values owing to higher prices. The introduction of a 40-hour week underground somewhat hampered output. The outlook for the coming year is dark; work was stopped on December 15 owing to power shortage, and this will continue till the end of April, giving a severe reduction in the current yeaf's output.

The Sulitjelma Mines won about 55,000 tonnes of iron pyrite concentrates; 12,000 (78,800) tonnes of flotation pyrites; 2,600 (2,400) tonnes of zinc concentrates and 2,970 tonnes of Bessemer copper. The smelter treated the copper concentrates of Björkaasen and Folldal in 1948-49 as well as copper matte from Orkla. A month's operation was lost in January owing to power cuts due to freezing up, which accounts for the reduction in output. However the value of the output showed an improvement. Ore development during the year was satisfactory.

The Nord-Norge Co. produced 3,400 (3,600) tonnes of pyrites concentrates; 290 (240) tonnes of copper concentrates; 3,200 (4,200) tonnes of zinc concentrates and 350 (460) tonnes of lead concentrates. Shortage of power was responsible for the drop in output. Development in Mofjell grube gave good results and diamond drilling from the adit in the Norwegian electric smelting works seems to indicate that the ore deposits continue far to the east on the strike.

The Bleikvasligrube at Korgen has now been turned over with the granting of the state guarantee of Kr.500,000. Continuation of diamond drilling has proved substantially larger ore reserves than the originally estimated 200,000 tonnes. Drifting on the deep adit has commenced. Last year 1,300 tonnes of crude ore was sent to the flotation plant at Andfiskå; estimated production in the coming year is 5,000 tonnes rising to 10,000 tonnnes in 1952.

The Orklagrube, one of the largest mines, produced 466,000 (469,000) tonnes of smelting and export pyrites. The Orkla Metal A/B Co. produced about 95,000 (81,000) tonnes of sulphur, 99.9 per cent pure and about 14,500 tonnes of raw matte and ferrous slag.

Stordökisgruber produced 55,100 (5,400) tonnes of graded pyrites (41.6 per cent S.), and 49,700 tonnes of washed pyrites (39.3 per cent S). This ore is silica-free and very low in copper, lead and arsenic.

The complex pyrites of Norway furnish all the lead and zinc output as there are no primary producers of these metals.

**Miscellaneous Mines**

The Kongsberg Sölvverk operated throughout the year and produced 3,000 (3,080) kilos of silver 99.8 per cent fine and 3,000 (3,500) kilos of silver nitrate, going 65.5 per cent silver.

Knaben produced 100 (127.754) tonnes of molybdenite concentrates going 91.93 per cent $MoS_2$. Examination and development of the deposit on a large scale was put in hand and conditions for co-ordinated operation planned when work is again resumed.

The total output of refined copper from Röros Copper Works was 1,108 tonnes produced from Bessemer copper and remelted scrap.

The Skaland Grafitverk suffered from power shortage in the early part of the year and the output 2,500 tonnes of milled products was about, 10 per cent down on the year.

On the Husvik lead-zinc field in Tjötta trial work started in November. In the current year essential development will be carried out. At the Skorovas mines also only preliminary work was done, and Gronggrube was on a care-and-maintenance basis.

# Cornwall and Devon

*By Our Own Correspondent*

THERE has been little change in the mining situation during 1950 although some slightly increased interest in metal mining was apparent towards the end of the year, with the greatly increased price of tin and tungsten whilst one or two properties have been examined recently.

**Geevor**

In the published accounts for the year ending March 31, Geevor mine showed an operating profit (before taxation and appropriation) of £68,375 and a 20 per cent dividend was declared. When considering this result it should be remembered that for the whole of the year under review, the price of tin had not reached the high figure that it did later in the year and was around £600 per ton. An interim dividend of 15 per cent has just been declared for the current year. Development throughout the year has shown substantial improvement and is very satisfactory, especially on No. 3 Branch lode. More mechanical loaders and electric locos are now in use underground whilst the installation of a new crushing plant at the Victory shaft has resulted in a further reduction in costs. Other improvements including increasing the middling regrind capacity by the addition of another Hardinge mill and more tables has been made. During 1950 the mine produced 680 tons of black tin.

**South Crofty**

Throughout the year, the Directors of South Crofty made repeated attempts to obtain a loan from the Treasury in order to finance a new pumping installation suggested in the Westwood's committee report. The scheme was approved by the Ministry of Supply who suggested a £50,000 loan bearing 3 per cent with no interest payable until the pumps had been working three months. Subsequently, however, the offer was withdrawn and in August last the Lord President of the Council said "I hold out no hope that the Treasury will reverse their previous decision, that they are unable to advance money. . . ." After this final refusal, the company was able to secure an advance from their bankers which should enable it to proceed with the scheme which is estimated will save £20,000 per annum over the present Cornish pumps which, last year, were estimated to have cost £58,000.

Unfortunately, almost at the end of the year, the company received a very serious setback when the beam of the 90 in. Cornish engine at New Cook's shaft broke in two without warning and completely wrecked the engine. In spite of operating the three throw ram pumps at Bickford's shaft and using bailing tank in Cook's shaft all the time and in Robinson's at night, the water continued to rise and the bottom levels of the New Cook's section became flooded. Dams have been built between the two sections of the mine and temporary pumping plant has been hastily obtained. This consists of two submersible pumps which will lift to a permanent station which has been prepared at the 205 fm level and will be pumped from here to surface by a second set of pumps. At the time of writing, one set has been installed and the pumps are now working. To add to the mine's troubles at the end of the year, the main rod of Robinson's engine broke and allowed the water to rise further before it could be repaired and later a serious fire broke out in part of the concentrating plant, and destroyed some plant before it was got under control. In spite of these accidents some production is being maintained. During the year development work was restarted on the Complex lode in Robinson's section and before the mishap, the level at the 340 fm horizon was being driven to connect with the Roskear shaft at Dolcoath which when completed should greatly improve the ventilation.

At Castle-an-Dinas mine a subsidiary of South Crofty, only 64 tons of wolfram was recovered from 7,520 tons milled (a recovery of 19.1 lb. per ton) whilst development footage amounted to 1,349 ft. A large influx of water handicapped operations but towards the end of 1950, the exceptional rise in the price of wolfram, has enabled the company to mine several blocks previously deemed unpayable. In spite of this the ore reserves have deteriorated and the question of sinking is being considered. As the extent of the granite intrusion, which is younger than the lodes and cut them off in depth, will be the deciding factor, it is proposed to put down a number of vertical bore holes to ascertain the contour of the intrusion below the bottom level.

**New Consols**

At New Consols mine, the 86 fm level has been unwatered and the shaft equipped for hoisting from this level whilst unwatering to the bottom of 96 fm level has proceeded. It is understood that the existing stage pumping is to be replaced by duplicate centrifugal pumps of 1,000 g.p.m. at the 64 fm level to pump direct to the adit whilst further duplicate pumps will be installed at the 96 fm to pump the water from the bottom to the 64 fm level. The shaft will then be sunk a further 200 ft. Development East on the 40 and 52 fm levels has yielded much better results and the grade of mill feed has improved. The Californian stamp battery is to be replaced by a Hardinge mill, classification is being improved and with the addition of some further plant, it is hoped to raise the capacity to 200 tons per day. The supply of compressed air has also been increased by the installation of two new compressors and the aerial ropeway to the mill has been completed.

**British Malayan Tin Interest**

At the Bassett property of the British Malayan Tin Syndicate modifications have been made and it is understood that although the note issue in August last was not subscribed, the directors have been able to raise the necessary money for additional plant, much of which has been installed.

**Wolfram, Barytes and China Clay**

Elsewhere in Cornwall, a small wolfram property is being reopened near Liskeard, a small pilot plant is operating on beach sand near Hayle and a tin-wolfram mine has just been resampled.

The china clay industry continues to be very busy and the export figures have exceeded those for the last two years, whilst the export to the United States amounted to 111,820 tons with a money value of £571,594. Total export figures were 405,223 tons worth £2,056,948 compared with 295,233 tons in 1949 worth £1,403,385. English Clays, Lovering, Pochin and Co. Ltd., the largest producer, showed a net profit of £414,229 after deduction of £517,714 income tax. This figure compares well with the net profit of £292,160 last year whilst the company have declared a final dividend of 3 per cent tax free in addition to the 2 per cent interim.

In Devonshire it is reported that the Hemerdon wolfram mine owned by the Government (and where a large plant was erected by the Ministry of Supply during the war) is to be reopened.

The Bridford mine of the Devonshire Barytes Co., which was put in the hands of a receiver last year, is now being worked by B. Laporte Ltd. and it is understood that production of barytes continues and that some modifications of the plant have been made.

# The North of England

IN the North metal mining is restricted to a very limited lead production but considerable quantities of barytes and fluorspar are being obtained from old lead mining areas.

In Cumberland, the Greenside mine, at Glenridding, on the edge of Lake Ullswater, continues production, whilst the Weardale Lead Co. produced 243 tons of lead and 7,025 tons of fluorspar from their Stotsfieldburn mine and 102 tons of lead from their Coptcleugh mine, making a profit of £1,250 for the year, according to their last report.

### Treatment of Dumps at Nenthead

At Nenthead, a new plant has been erected to treat the dumps of the Rodderup mine estimated to contain about 60,000 tons of fluorspar and was started in June last. This all flotation plant has been erected in the old mill buildings of the Vieille Montagne mine and is being operated by Anglo-Austral Mines Ltd., which represents the mining interests of National Smelting Co. and the Imperial Smelting Corp.

The same company is sinking at Haggs mines, Nentesbury, on a lead lode, opening up the Heights mine in Weardale and the Cambokeels mine at Eastgate for fluorspar. In addition, they continue to work the Cowgreen barytes mine in Teesdale as well as the Muirshiels barytes mine in Scotland.

A new dressing plant has been erected at the Coldberry mine, near Middleton-on-Teeside, whilst the Fluishiemere mine in the same district has closed.

The Coalcleugh mine at Carshields, near Hexham, Northumberland and situated two miles N.E. of Nenthead, is working on the Barneycrag vein, the owners being Wardle and Ridley, of Haltwhistle.

In Weardale, the United Steel Company are still developing the Blackdene mine at Wearhead and have sunk a shaft 150 ft. below the bottom adit and the old workings, where the lode has been intersected. The fluorspar is said to be of good quality in the bottom of the mine.

In Westmorland, the Silverband mine continues to be worked by B. Laporte Ltd. and the Humphreys spirals are now being used to treat fines from the washers.

In Derbyshire, Constables (Matlock Quarries) Ltd. continue to work their Masson fluorspar mine as an open pit. The ore is trucked to Megdale, adjoining their limestone quarry, where it is dressed by washing, jigging and table flotation at the rate of 100 to 150 tons per day. This company also buys outside spar ores and is the largest single producer of gravel spar, being responsible for about 50 per cent of the total output.

### J.C.I. in Derbyshire

During the year more lead has been recovered and the plant is being enlarged, whilst the Oxclose shaft is being re-opened for fluorspar. In conjunction with Johannesburg Consolidated Investment, the Derbyshire Stone Co. have been carrying out a prospecting programme for lead in the Matlock area and some boreholes are now being put down.

Elsewhere, the Glebe mine at Eyam is producing acid grade spar from its sink and float and flotation plant, whilst the Pontaway Lead Co., owned by H. J. Enthoven & Sons Ltd., are prospecting for lead near Elton.

It is also reported that an outcrop deposit of fluorspar has recently been discovered at Lathskilldale, near Youlgrave, and is being worked privately.

# The Colonial Geological Surveys

MOST of the Colonies which already possessed Geological Survey Departments have now practically completed the expansion made possible by grants under the Colonial Development and Welfare Acts, and the increase in staffs enabled more Geological mapping to be carried out during the year than had ever before been done in a similar period. It is not practicable to describe the activities of the Geological Surveys of twenty Colonies without making the account too long, and it is necessary to read the Annual Report of each Colony really to appreciate what is being achieved. It must suffice here merely to mention the considerable progress which has been made in the investigation of mineral deposits; for example, important new deposits of bauxite have been found in Sarawak; seams of good quality coal are being investigated in Benue Province of Northern Nigeria, 60 miles north of the Enugu Colliery; lead-zinc deposits are undergoing examination in Southern Nigeria; and the soils of the Tororo carbonatites, Uganda, are being examined for their possibilities as economic sources of iron and steel and phosphate. Geological studies have been made of large engineering projects and a great deal of successful water supply work has been done.

There are geological survey departments in Nigeria, Gold Coast, Sierra Leone, Uganda, Kenya, Tanganyika, Nyasaland, Swaziland, Bechuanaland, Federation of Malaya, Sarawak and North Borneo, British Guiana and Jamaica, and small surveys with one or two geologists are now being started also in Northern Rhodesia, Aden, British Honduras, Cyprus and the British Solomon Islands Protectorate. There is a Government Geologist also in Trinidad engaged in the production of a geological map.

**Growing Staff**

There has been a further increase in the staffs of geologists, geophysicists and chemists and the recruitment figures have been 10 in 1947, 21 in 1948, 42 in 1949 and 52 in 1950. These new appointments, after allowing for the losses by retirement, have expanded the total overseas scientific staff from 58 in 1947 to 72 in 1948, 110 in 1949 and 155 in 1950. Many of the newcomers had only recently graduated as geologists and several years must elapse before Geological Surveys will be fully staffed with experienced men and before new departments in other Colonies can be inaugurated. The senior men necessarily have more supervisory work than usual, but in Nigeria, Gold Coast, Uganda, Kenya, Tanganyika, Nyasaland and British Guiana, some help has arrived in the shape of 13 American and Canadian experienced geologists, appointed under the E.C.A. scheme. These men are supernumerary to Establishments and do not occupy posts open to British and Commonwealth geologists.

During the year recruits for the normal establishments have been appointed from fifteen Universities in the United Kingdom as well as from Universities in Australia, Canada, New Zealand and the Union of South Africa; only 12 vacancies remain to be filled in 1951.

A Colonial Development and Welfare grant of £325,000 for the expansion of the Geological Survey of the Federation of Malaya was approved during the year with provision for a total of 12 additional geologists of whom three have already been appointed as well as three new men to replace two transferred to Borneo, and one who, most unfortunately, was killed by bandits. Under the present emergency conditions, geological mapping cannot be conducted in many areas of Malaya, and so the very important task of searching for additions to disappearing mineral reserves must perforce be postponed.

The improvement in the staff position has enabled Geological Surveys in the Colonies to increase the assistance they can give to one another and to territories not possessing Geological Surveys. During the year Nigeria has seconded a senior officer to carry out new surveys in Aden, and the Director of the Geological Survey of British Guiana, in his capacity as Geological Adviser to the Caribbean Colonies paid a visit to the Leeward Islands, Jamaica and British Honduras. The Senior Geologist of British Guiana has been seconded to British Honduras for one year to examine an area in which mineral deposits may occur.

**Regional Conferences**

Dr. F. Dixey, Geological Adviser to the Secretary of State and Director of Colonial Geological Surveys visited Accra to attend the first Conference of Directors of the West African Geological Surveys and others present included the Assistant Director of Mines of French West Africa, and the Professor of Geology at the new University College of Accra. Arrangements were made for co-operation between the British and French Geological Surveys in the solution of certain geological problems of correlation. Afterwards, Dr. Dixey visited the West African Colonies to discuss Geological Survey activities, organization and staff, and to see something of the latest developments of the mining industries. There was a Conference of East African Geological Surveys at Nairobi. During the year also the Geological Surveys of British Guiana, Dutch Guiana and French Guiana met in Surinam to discuss certain common problems.

The Directorate in London arranged various courses of instruction for geologists and chemists on leave from overseas and for newly appointed men. A three weeks course in Photogeology was attended by 32 geologists. The Mineral Resources Division of the Directorate has continued to be actively engaged on a wide range of chemical analyses and other investigations connected with Colonial mineral resources. It has also dealt with numerous enquiries regarding mineral occurrences, products and trade received from officials, firms and individuals at home and overseas, and it has prepared a number of reports. This Division is responsible for the new periodical *Colonial Geology and Mineral Resources*, the first issues of which have already appeared. It succeeds the Mineral Resources section of the former Bulletin of the Imperial Institute but is planned on more comprehensive lines and with a definite Colonial viewpoint.

**Photogeological Section**

The Directorate also includes a Photogeological Section which maintained liaison with Directors of Geological Survey and prepared photogeological maps of suitable areas. These include provisional maps prepared in advance of field work, extensions of areas already mapped in the field, or maps supplementing field reconnaissance mapping. The Section is stationed at Bushy Park at the headquarters of Colonial Topographic Surveys.

Dr. Shaw of the Directorate visited the headquarters of the United States Geological Survey and also the Geological Survey of Canada to study their photogeological and geophysical organizations. By arrangement with the Nigerian Geological Survey, he later spent six weeks on the Plateau Tinfields of Northern Nigeria making a trial application of magnetic and resistivity methods in the location of sub-basaltic tin leads.

The Universities are taking an increased interest in problems of Colonial geological research. Two members of the teaching staff of Imperial College, London, visited Tanganvika; the Professor of Geology of Sydney University took a party to the British Solomon Islands and a Geophysicist from the University of Glasgow spent his long vacation making a gravimeter survey in the Albert Rift Valley, Uganda.

# Review of the Share Markets

*By Our Stock Exchange Correspondent*

THE year 1950 was marked by two major political events. The first was the General Election in the United Kingdom. The indecisive result left the market in an uncertain state of mind. During the months preceding the election, there was little business and after the outcome was known markets remained idle. The general feeling among investors was one of relief that the Government majority in the House of Commons was no larger.

The second event of importance was the outbreak of war in Korea towards the end of June. The immediate effect of this was a heavy marking down of share values, but on the whole there was little selling. An interesting point was that the London market only fell about one-third as far as Wall Street. After being hammered for five years by constant crises, the British investor is apparently "punch-drunk."

Trading conditions remained at a low ebb until October when the effects of rearmament, stockpiling and inflation began to make themselves felt. One result of this was a switch by investors from gilt edged and other fixed interest securities into industrial equities and base metal shares.

**Kaffirs**

Kaffir shares were a weak market during the first six months of the year. The effects of devaluation were wearing off and the rising trend of costs and wages began to assert themselves. After the outbreak of the Korean war in June, gold returned to popularity on the free markets of the world and a recovery set in.

During the year the South African government obtained a concession from the International Monetary Fund to sell a proportion of its gold for industrial purposes at free market rates. By December, such sales were estimated to be about 40 per cent of the total output. The necessity for America to finance most of the rearmament bill, not only for herself but also for her allies, caused the United States to become a net exporter of gold for the first time in many years. This trend was accentuated by the high price of commodities. The fact that countries other than the United States became a market for gold was in some measure a healthy sign, although the conditions causing it are to be deplored. Towards the end of the year the usual rumours of a possible devaluation of the American dollar in relation to gold were current, but these were repeatedly denied by the authorities.

Rand mines were compelled to grant concessions to labour—shorter hours and higher wages. Over the whole South African picture hangs the uncertainty of racial legislation. The present Nationalist administration is committed to a policy of segregation of all natives and coloured peoples, and in some quarters it is thought that this must eventually lead to political disturbances within the Union.

In the Orange Free State work went forward rapidly on the developing mines. Several new companies were floated and the St. Helena and Welkom mines are now nearing the production stage. Both properties reported promising underground developments on the reef. Owing to the vast amount of capital required to develop this field the market has been rather quiet, but towards the end of the year there were signs of increasing interest among investors as the production stage approached.

Most of the leading finance houses operating in the Cape have shown relatively little change from 1949 although the income from the individual mines has considerably increased. The explanation, of course, is that all the companies have had to plough in large sums of money in order to finance developments in the Orange Free State.

**West Africans**

The West African market was weak throughout the year. Rioting was a prelude to the granting of the new constitution. Earlier in the year it was announced that the Gold Coast government had agreed to examine the taxation situation but shortly afterwards withdrew their concurrence without taking any further steps. This was hard on the gold mines which are still paying the high level of taxation imposed during the war.

Two interesting events occurred on the Gold Coast during 1950. The Gold Coast Selection Trust purchased dredging rights on the Offin river from the company of that name and subsequently arrived at an agreement with Bremang Gold Dredging to provide for the latter company working the properties when their own areas on the Bremang river become exhausted. Secondly, Selection Trust Ltd. prospected the Ashanti properties outside the area already being worked. No worthwhile developments occurred, however, and the agreement was terminated.

**Australian Shares**

Australian gold shares showed relatively little change compared with the previous year. The continued talk of a possible upward revaluation of the Australian pound created uncertainty. While serious internal inflation still harasses the Commonwealth government, the country is very prosperous due to sharp rises in commodity prices. The gold mines are still reported to be suffering from the shortage of labour.

Two new companies were floated during the year: Great Western Consolidated in April, which was formed to work deposits in the area of the Copperhead mine in the Yilgarn district, and Kalgoorlie Southern Gold to work claims near the Golden Mile.

**Coppers**

Coppers recorded large gains during the period. The price of the metal rose sharply due to the demands of rearmament and stockpiling. The emigration of five major companies to avoid heavy U.K. taxation was an important event. These concerns were Messina Transvaal, Rhokana, Nchanga, Rhodesia Anglo American and Rhodesia Copper Refineries. While this trend is understandable, it is nevertheless to be greatly deplored inasmuch as it tends to weaken London's position as the world's mining financial centre.

During the year the Bank of England sold its holding of 1,667,961 shares in the Tanganyika Concessions to an Anglo-Belgian group. Tanks control the Benguela railway and hold a large block of Union-Miniere shares. 600,000 Tanks were later re-sold to an American group in November. Nchanga Coppers paid a maiden dividend of 20 per cent.

The management of Wankie Colliery was taken over by Powell Duffryn Ltd. who invested £500,000 in the concern. Production is going ahead and transport bottlenecks are being eliminated. A scheme is also in hand for producing oil from coal.

### Tin

Eastern tin shares started the year badly. Communist successes in Malaya, Indo-China and Korea, together with the chaotic state of Indonesia, caused investors to neglect this market. Towards the end of the year, however, better reports from the East and the courageous stand taken by miners and planters in Malaya brought a ray of hope and this, coupled with the sudden rise in the price of the metal, brought about substantial gains. Nevertheless, the yields on many tin shares remained high.

### Diamonds

Diamonds had a record year. The value of the stones sold, both gem and industrial, constituted an all time high. After the good results of 1949, investors anticipated some falling off. In May came the renewal, for a term of six years, of the diamond sales agreement. Later, Korea caused a substantial demand for gem stones from America and an increase in the use of industrial diamonds for rearmament and stockpiling. Diamond shares finshed the year at a high level.

### Lead and Zinc

In the lead/zinc market, conditions were also good although Barriers were disrupted by a series of strikes. Earlier, the Mount Isa dividend was reduced from 25 per cent to 15 per cent but the fall in the value of the shares was almost immediately covered by informed buying. Lake George Mines proved popular among investors as they are not affected by the low Australian internal price of lead. Rhodesia Broken Hill shares improved as soon as the company emigrated to Rhodesia. The American demand for zinc continued strong.

Dollar securities rose sharply on the implications of the rearmament programmes and in London a general scramble for Canadian securities took place. The outlook for International Nickel shares underwent a complete change after Korea. At the beginning of the year the chairman had reported difficulties in disposing of stocks of nickel, but the metal is now in short supply and there remains a big demand for stockpiling purposes.

### Oil

Oil companies started badly. The statistical outlook for oil was uncertain and the shares had been friendless. Later on, higher consumption and increased dividends by Burmah Oil and Shell cheered the market. The third of fifteen instalments due to the Mexican Eagle company by the Mexican government was paid and a further distribution was made to shareholders. The Ultramar company overcame its financial difficulties and the shares finished strongly. The latest results from the Mercedes field caused satisfaction in the market.

### Manganese and Wolfram

One effect of rearmament was to cause a world shortage of manganese and wolfram. Central Provinces manganese overcame transport difficulties and, encouraged by the Indian government, settled down to a good rate of production. Associated Manganese of South Africa also enjoyed a record year. The severing of wolfram supplies from China and Korea caused a complete change in the outlook for Beralt Tin and Wolfram. By the end of the year the shares had risen sharply. The demand far exceeded the quantity of ore that the company was able to produce.

1950 can thus be seen to have been a year when political influences radically altered the outlook for mining concerns. Within the limits of rearmament and stockpiling programmes the future trend for mining should continue to be relatively prosperous. In semi-artificial market conditions such as the present, however, there can be no such thing as a "firm" forecast. Inflation would appear to be the big problem of the immediate future.

## HIGH AND LOW PRICES REACHED BY LEADING MINING SHARES DURING 1950

| | High. | Low. |
|---|---|---|
| **Finance** | | |
| African & European | 87/6 | 47/6 |
| Anglo American Corpn. | 8⅛ | 6⅛ |
| Anglo-French | 25/6 | 20/- |
| Anglo Transvaal Consol | 45/- | 30/4 |
| Camp Bird | 15/4 | 11/- |
| Central Mining (£1 shrs.) | 56/3 | 40/- |
| Consolidated Goldfields | 62/6 | 46/- |
| Consol. Mines Selection | 44/4 | 28/1 |
| East Rand Consols | 11/7 | 4/1 |
| General Mining | 7⅞ | 5¼ |
| H.E. Prop. | 45/- | 35/- |
| Henderson's Transvaal | 10/6 | 9/- |
| Johnnies | 88/9 | 62/6 |
| Rand Mines | 7⅜ | 6¼ |
| Rand Selection | 50/- | 35/- |
| Union Corporation | 12⅜ | 9⅜ |
| Vereeniging Estates | 5¼ | 4⅛ |
| Writs | 37/3 | 25/4 |
| West Wits | 65/7 | 40/7 |
| **Rand Gold** | | |
| Blyvoors | 51/3 | 40/- |
| Brakpan | 25/9 | 18/1 |
| City Deep | 83/4 | 60/- |
| Consol. Main Reef | 70/- | 50/- |
| Crown | 6 | 4⅜ |
| Daggas | 92/6 | 63/9 |
| Dominion Reefs | 4/7 | 1/7 |
| Doornfontein | 31/3 | 15/10 |
| Durban Deep | 94/4 | 66/3 |
| E. Daggas | 36/10 | 26/3 |
| E. Geduld (4/- units) | 54/9 | 42/6 |
| E. Rand Props | 84/- | 54/9 |
| Geduld | 8¼ | 6⅜ |
| Grootvlei | 45/9 | 35/- |
| Libanon | 27/6 | 16/1 |
| Luipaards Vlei | 31/3 | 20/9 |
| Marievale | 28/1 | 20/- |
| Modderfontein B | 8/3 | 4/9 |
| Modderfontein East | 71/3 | 50/- |
| New Kleinfontein | 41/- | 28/6 |
| New Pioneer | 50/- | 19/1 |
| Randfontein | 27/4 | 17/10 |
| Robinson Deep | 30/6 | 16/6 |
| Rose Deep | 48/1 | 32/6 |
| Simmer & Jack | 16/6 | 12/7 |
| Springs | 15/2 | 9/4 |
| Sub Nigel | 4⅛ | 4⅛ |
| Van Dyk | 18/9 | 15/- |
| Venterspost | 43/3 | 27/3 |
| Vlakfontein | 26/1 | 20/- |
| Vogelstruisbult | 28/6 | 22/- |
| West Driefontein | 96/10 | 66/3 |
| W. Rand Consolidated | 54/4 | 33/9 |
| Western Reefs | 42/3 | 31/10 |
| **O.F.S. Gold** | | |
| Blinkpoort | 39/3 | 20/- |
| Central Mining F.S. | 7/4 | 4/3 |
| Freddies | 37/4 | 15/2 |
| Freddies N. | 18/1 | 7/4 |
| Freddies S. | 18/4 | 7/9 |
| F.S. Geduld | 88/6 | 51/3 |
| Geoffries | 51/7 | 15/- |
| Lydenburg Estates | 30/- | 7/6 |
| Middle Wits | 48/7 | 18/6 |
| Orsits | 63/- | 37/10 |
| President Brand | 38/1 | 19/3 |
| President Steyn | 32/- | 13/9 |
| St. Helena | 48/9 | 29/1 |
| U.F.S.C. & G. | 26/7 | 9/- |
| Virginia Deb. | 104¾ | 65 |
| Virginia Ord. | 20/- | 10/3 |
| Welkom | 60/6 | 35/- |
| Western Holdings | 80/- | 47/6 |
| **West African Gold** | | |
| Amalgamated Banket | 3/- | 1/9 |
| Ariston | 9/7 | 7/- |
| Ashanti | 41/6 | 28/9 |
| Bibiani | 17/9 | 11/- |
| Bremang | 5/7 | 3/3 |
| G.C. Main Reef | 6/7 | 3/4 |
| G.C. Selection Trust | 14/- | 8/9 |
| Konongo | 3/11 | 1/7 |
| Kwahu | 10/5 | 3/3 |
| London & African Mng. | 3/6 | 7d |
| Lyndhurst Deep | 3/- | 10d |
| Marlu | 3/6 | 2/1 |
| Nanwa | 2/1 | 11d. |
| Taquah & Abosso | 14/9 | 8/1 |
| **Australian Gold** | | |
| Boulder Perseverance | 6/8 | 4/7 |
| Gold Mines of Kalgoorlie | 17/1 | 13/6 |
| Great Boulder Prop. | 11/7 | 7/- |
| Great Western Consol. | 4/- | 1/11 |
| Lake View & Star | 27/4 | 21/3 |
| Mount Morgan | 21/3 | 14/1 |
| North Kalgurli | 25/3 | 18/9 |
| Paringa | 2/7 | 1/1 |
| Sons of Gwalia | 17/9 | 10/9 |
| South Kalgurli | 13/6 | 8/1 |
| Western Mining | 11/- | 7/3 |
| Wiluna | 12/- | 5/5 |
| **Miscellaneous Gold** | | |
| Cam and Motor | 35/7 | 25/- |
| Champion Reef | 12/- | 8/9 |
| Falcon Mines | 9/7 | 6/4 |
| Globe & Phoenix | 27/- | 20/10 |
| **Misc. Gold (contd.)** | | |
| G.F. Rhodesian | 11/3 | 7/3 |
| London & Rhodesian | 5/6 | 4/1 |
| Motapa | 8/4 | 3/7 |
| Mysore | 8/9 | 5/9 |
| New Guinea | 1/9 | 9d. |
| Nundydroog | 10/6 | 6/11 |
| Ooregum | 2/6 | 2/9 |
| Oroville | 14/9 | 8/7 |
| St. John d'El Rey | 28/9 | 18/9 |
| Zams | 35/9 | 19/6 |
| **Diamonds** | | |
| Anglo American Inv. | 71/3 | 51/3 |
| Casts | 36/- | 27/1 |
| Cons. Diam. of S.W.A. | 63/9 | 37/6 |
| De Beers Defd. Bearer | 55/- | 36/9 |
| De Beers Pfd. Bearer | 19½ | 16½ |
| **Copper** | | |
| Chartered | 69/3 | 49/6 |
| Indian Copper | 5/- | 3/1 |
| Messina | 95/- | 45/9 |
| Nchanga | 6⅜ | 57/6 |
| Rhod. Anglo-American | 53/- | 30/3 |
| Rhodesian Selection | 37/7 | 24/- |
| Rhokana | 20¼ | 11⅞ |
| Rio Tinto | 22 | 14¼ |
| Roan Antelope | 20/7 | 11/- |
| Selection Trust | 44/9 | 27/6 |
| Tanks | 43/3 | 21/7 |
| Tharsis Sulphur Br. | 45/9 | 31/3 |
| **Tin (Eastern)** | | |
| Anglo-Burma | 5/10 | 1/9 |
| Ayer Hitam | 28/10 | 17/6 |
| Bangrin | 26/9 | 13/- |
| Bongkong | 13/3 | 8/1 |
| Hongkong | 16/6 | 9/4 |
| Ipoh | 36/- | 21/6 |
| Kamunting | 13/- | 7/4 |
| Kepong Dredging | 15/3 | 7/10 |
| Kinta Tin Mines | 16/1 | 11/3 |
| Kramat Pulai | 5/9 | 4/3 |
| Malayan Dredging | 26/- | 18/1 |
| Pahang | 15/3 | 8/7 |
| Pengkalen | 9/7 | 6/1 |
| Petaling | 13/- | 9/- |
| Rambutan | 20/- | 11/3 |
| Siamese Tin | 19/9 | 12/6 |
| Southern Kinta | 17/3 | 12/9 |
| S. Malayan | 31/6 | 20/1 |
| S. Tronoh | 27/4 | 17/6 |
| Sungei Kinta | 17/3 | 12/9 |
| Tekka Taiping | 14/9 | 9/- |
| Tronoh | 33/- | 21/1 |
| **Tin (Nigerian and Miscellaneous)** | | |
| Amalgamated Tin | 13/7 | 7/6 |
| Beralt Tin | 20/1 | 7/7 |
| Bukit | 3/7 | 2/1 |
| British Tin Inv. | 18/- | 11/- |
| Ex-Lands Nigeria | 7/1 | 3/11 |
| Geevor Tin | 14/9 | 6/3 |
| Gold & Base Metal | 4/- | 1/10 |
| Jantar Nigeria | 5/9 | 2/3 |
| Jos Tin Area | 11/4 | 9/9 |
| Kaduna Prospectors | 5/6 | 3/6 |
| Kaduna Syndicate | 11/5 | 6/9 |
| London Tin | 5/7 | 3/6 |
| Ribon Valley | 1/5 | 7d. |
| United Tin | 2/1 | 6d. |
| **Silver, Lead, Zinc** | | |
| Broken Hill South | 48/- | 35/- |
| Bruma Corporation | 6/4 | 3/1 |
| Consol. Zinc | 32/10 | 22/5 |
| Lake George | 28/6 | 10/1 |
| Mining Trust | 4/7 | 3/6 |
| Mount Isa | 36/6 | 28/6 |
| New Broken Hill | 33/6 | 23/- |
| North Broken Hill | 73/3 | 58/1 |
| Rhodesian Broken Hill | 19/4 | 9/1 |
| San Francisco Mines | 64/6 | 29/9 |
| Trepca | 4/- | 2/1 |
| **Miscellaneous Base Metals & Coal** | | |
| Amal. Collieries of S.A. | 60/- | 48/3 |
| Associated Manganese | 84/6 | 35/9 |
| Chinese Engineering | 4/7 | 1/3 |
| C.P. Manganese | 54/7 | 35/- |
| Natal Navigation | 106/3 | 68/9 |
| Wankie | 22/9 | 13/3 |
| Witbank Colliery | 90/- | 79/- |
| **Canadian Mines** | | |
| Dome | $27½ | 26 |
| International Nickel | $70¼ | 49⅛ |
| Mining Corpn. of Canada | £6⅛ | 70/7 |
| Noranda | $142¼ | 103 |
| Quemont | £8⅛ | 6¾ |
| **Oil** | | |
| Anglo-Iranian | 7⅛ | 5⅞ |
| Apex | 42/2 | 29/4 |
| Attock | 30/3 | 20/- |
| Burmah | 69/8 | 48/9 |
| Canadian Eagle | 30/4 | 22/7 |
| Mexican Eagle | 23/4 | 15/- |
| Shell | 72/2 | 62/2 |
| Trinidad Leasehold | 26/9 | 20/1 |
| T.P.D. | 28/4 | 20/6 |
| Ultramar | 21/3 | 6/4 |

# Taxation in the Mining Industry

## The Problem of Company Migration

THE Finance Bill published last month contains proposals which may well result in the final discouragement of new mining enterprises operating overseas from ever establishing themselves in this country.

Under Section 32 dealing with domicile, the Bill, if passed, in its present form, makes it unlawful for any United Kingdom resident company (1) to emigrate, (2) to transfer to a non-resident any part of its trade or business, (3) to permit any non-resident company controlled from this country to create or issue any shares or debentures, (4) to transfer any shares or debentures of any United Kingdom controlled but non-resident company, except with prior Treasury consent. But since loss of tax is now ground for refusal rather than as formerly when loss of foreign exchange was the criterion, not much hope can be held out that such consent will, in fact, be given.

### Government Tackles Effects Instead of Causes

In the absence of any official interpretation the Bill, as it stands, appears very much like an unqualified admission that the heavy burden of taxation at present borne by British overseas companies would result, if not prevented, in a flood of companies seeking to transfer control to financial centres elsewhere. By the end of 1950, the total issued capital of companies which had transferred their seats of management abroad amounted to £37,000,000 nominal. Moreover, it was no secret that there were many more companies mulling over the question as to whether continued executive control from London was worth the taxation involved. But instead of attempting to deal with the causes which drove these companies abroad, the Bill seeks to smother the effects.

To prohibit the emigration of mining companies provides no permanent solution. For unless and until the present taxation code is revised to give British overseas mining companies an opportunity of competing on equal terms with similar companies resident abroad, fresh enterprise will not be attracted to this country. If this happens, then it follows that as the existing mines controlled from this country become exhausted not only must the British overseas mining industry in time be reduced to insignificant proportions, but also London's leadership in the world of mining finance, a position which she has occupied for more than a century, must inevitably be lost.

### U.K. Taxation Compared with Other Countries

Of the many tax disabilities suffered by British overseas mining companies relative to other countries, profits tax and the levying of U.K. income tax on undistributed profits are the worst. Taken together these two imposts were the main single cause for the recent exodus. For mining companies were finding it increasingly difficult to retain sufficient profits to finance the cost of replacing assets, explore for new deposits and, at the same time, provide for the payment of adequate dividends.

Another serious deterrent under the present tax code to fresh enterprise setting up house in this country is the inadequacy of depletion allowances. Since the basic asset of a mining company is of a wasting nature there is a limit to the life of each mine. It is, therefore, imperative that each company should be able to build up a fund over the life of the mine out of profits as tax-free depletion allowances to be used for the express purpose of prospecting and developing new mines to replace those worked out. But the present tax code only partially recognizes that producing mines are wasting assets and depletion allowances are restricted to the cost of the concession to the first U.K. purchaser. As the cost of exploring for new mines can only be financed out of available funds, U.K. controlled mining companies are, therefore, at a serious disadvantage compared with similar enterprises resident abroad which are granted tax-free allowances to build up funds for this purpose.

In Canada, for example, Canadian corporations engaged in mining abroad are not liable to national income tax at all provided the management, and designing and transportation of goods are carried on within Canada. Further, depletion allowances for mines have been given since World War I, thereby recognizing from the outset that in extracting minerals from the ground, the operating company is reducing the worth of its property by the actual value *in situ* of the minerals extracted. Current depletion deductions allowed for base metal mines amount to 33⅓ per cent of net income and for gold mines 40 per cent, or $4.00 per oz., whichever is the greater sum. In the United States and Australia, the taxation systems in force are also shaped to stimulate the development of natural resources in the national interest. In the United States, current depletion deductions for base metal mines stand at 15 per cent of gross revenue, subject to an over-riding maximum of 50 per cent of net income, while in Australia, income from gold mining operations is not liable to Federal income tax at all, and is also exempt from tax in the hands of shareholders when paid to them as dividends. In South Africa, tax is levied only on income arising from sources within the Union.

**B.O.M.A. Speaks Out**

The British Overseas Mining Association, which speaks for about one hundred overseas mining companies, has consistently questioned the wisdom and justness of our present taxation code as applied to the British overseas mining industry. Recently, the Association had occasion to review the whole question of taxation in this context and proposed the following reforms to enable British overseas mining companies to compete on equal terms with similar companies resident abroad. First and foremost, profits derived from mining operations abroad must be entirely exempt from U.K. profits tax both in respect of the operating company and its shareholders. Secondly, profits from overseas mining should be made subject to U.K. income tax only to the extent that they are remitted to this country and finally, that depletion allowances should be granted on lines comparable, for example, with those operative in Canada and the United States.

Although the proposals were recommended in a memorandum to the Chancellor of the Exchequer in February last, the Finance Bill does not in any way vitiate their validity. On the contrary, the Bill focuses attention on the heart of the matter which is that unless the above mentioned tax reforms are implemented, the days of London as the centre of world mining finance are numbered. The loss to the national economy of this country, should this occur, would be immense.

London's leadership in the world of mining finance has been, as Mr. Chester Beatty once said, one of the mainstays of its financial importance and has given to this country incalculable benefits which, if impossible to measure in pounds, shillings and pence, have been a very valuable asset to industry as a whole. A steady inflow of investment income arising from mining enterprises abroad has contributed hugely to our invisible earnings and played an important part in maintaining this country's balance of payments and standard of living. Valuable mineral deposits of strategic and economic importance have been at our disposal and under our control in peace and war. Refineries and related industries have been established in this country providing large scale employment, while by virtue of executive control being vested in this country, mining equipment manufacturers have been afforded a ready market for their products. Additionally, and despite a dwindling metalliferous industry at home, British mining engineers and geologists were encouraged to develop their skills and enabled to find employment in British controlled mines abroad. Nor can the benefits be evaluated which accrued to banking, insurance, shipping and other trading services when London was the hub of world mining finance.

These are the advantages which this country stands to lose if the present system of mulcting the existing overseas mining companies by subjecting them to an inequitable and crushing burden of taxation is continued.

# Approach to Free State Gold Production

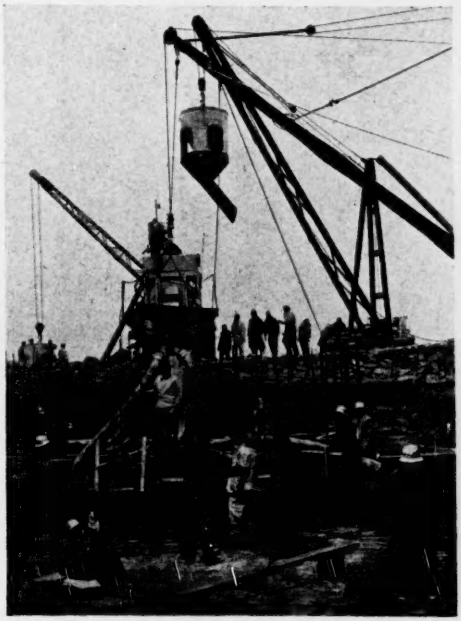
*By Our South African Correspondent*

THIS year the Orange Free State will start to produce gold. The first two of the 13 gold mines being developed in that area are now on the threshold of production. Four more will start next year, and the remaining seven mines are expected to start milling during the following four years.

When they are all in full production the 13 mines will, it is estimated, produce about 8,000,000 oz. of gold a year, worth nearly £100,000,000 at the present price. If the new mines are given a life of only 30 years they will thus produce about £3,000,000,000 worth of gold at to-day's price, or about £10,000,000 more than the actual value of gold produced by all the existing and past gold mines on the Rand in the last half century or so.

The importance of the new mines to the country's future economy is such that no effort will be spared to reach full production. At present the mines have sufficient labour for their initial needs, and there is no real shortage of electric power. There is, however, a water shortage. The outlook seems to be that power and water will be adequate, but that there may be insufficient labour to reach maximum production. The Rand has survived labour shortages, however, and the assessment of the future of the Free State is a matter not of success or failure, but rather of degree of success.

Practically nothing has been left to chance. The gold field has been more thoroughly explored than any other potential mining field in the world, and the area has been satisfactorily proved; already more than £3,000,000 has been spent on drilling alone; as many as 480 boreholes being sunk.



**Shaft collar at Merriespruit No. 1 shaft in process of construction, showing reinforcing steel being placed in position. Bucket at top of illustration conveys concrete from mixer to distribution box from which it flows through hoses into position behind the shuttering. Rocky ledge in background will become the floor of the high service gallery shown in photograph on next page.**

## Target Dates

Before considering the problems, it would be as well to take a look at the general prospects of the goldfield. The two most advanced mines are St. Helena and Welkom. Both are expected to start production soon after the middle of this year. No official estimate has been given of the production dates for the Freddies North and Freddies South mines, but it is likely that their reduction plants will be finished before the middle of next year; if so, they are expected to lose no time in starting production. Western Holdings is also expected to begin milling about that time, followed towards the end of next year by Free State Geduld. President Steyn should start up in the first half of 1953. President Brand will probably start a few months later.

The remaining mines cannot be tied down to any schedules at this stage, but between 1953 and 1956 Virginia, Harmony, Merriespruit, Loraine and Jeannette should come into production, probably in that order.

The richest mines will be Free State Geduld, Western Holdings and Harmony, unless development belies prospecting results. Merriespruit, Loraine and Jeannette appear to be at the lower end of the scale, with comfortable, but not spectacular, payability.

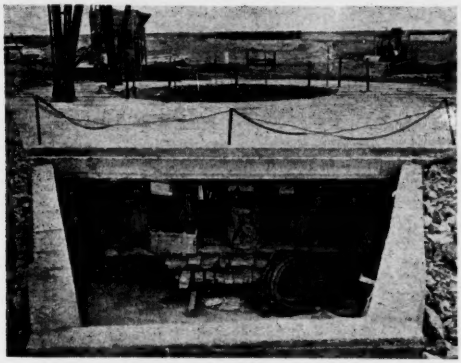
St. Helena and Virginia were deliberately given advantages in their lease terms in recognition respectively of the large amount of pioneering work done and the attraction of the first direct subscription of American capital. It is too early to say whether any of the other mines have obtained relatively favourable lease terms, but it seems possible that Harmony and Welkom might show up favourably against their initial assessments.

Development results of Welkom and St. Helena up to the end of 1950 were very satisfactory. The pay limit is probably around 100 in.-dwt. Against that are the following development results:—Welkom: No. 1 shaft intersection, 247 in.-dwt.; No. 2 shaft intersection, 420 in.-dwt.; reef development in the third quarter of 1950, 404 in.-dwt.; fourth quarter, 561 in.-dwt. St. Helena: Average for reef development in 1949, 274 in.-dwt.; first quarter of 1950, 297 in.-dwt.; second quarter, 297 in.-dwt.; third quarter, 252 in.-dwt.; fourth quarter, 377 in.-dwt.

## Labour Requirements

The new fields started with a certain advantage over the Rand producers. The latter mines have had to reach their present degree of efficiency largely through the hard process of experience. The Free State mines can take full advantage of the experience of the Rand producers and avoid many mistakes. Further, the production by the older mines has put the controlling houses in such a strong financial position that much of the Free State's capital supply was, in effect, already assured before the mines needed it.

But the new mines start at a disadvantage in their claim for native labour. At the moment their needs are relatively modest, though they are growing rapidly. In January last year the number employed on the Free State mines was 11,408. At the same time in 1949 the number was 6,454 and in 1948 2,991. From the level at the beginning of last year the number continued to grow steadily, reaching a peak of 19,849 at the end of May.



**View of completed shaft collar at Merriespruit No. 1 shaft showing the completed collar and the service gallery by which lines for power, water and air will enter this shaft. The shaft diameter inside the lining is 24 ft.**

By then the seasonal decline in the total supply of natives for mining made itself felt in the Free State for the first time since the new fields were opened up, and the number had declined to 16,215 by July. Then the peculiarity of the demand by the Free State mines reasserted itself and the number began to rise again.

The demand was peculiar because the need was for men suitable for shaft sinking and other preliminary operations which carry more attractive rates of pay. Up to now the Free State has suffered no significant shortage of these men. The difficulties are more likely to begin to arise when several mines reach the production stage.

If they needed labour on the same scale as the mines on the Rand the Free State companies would probably want something like 100,000 natives. Improved layouts and the use of such modern mechanical aids as is practicable, however, are expected to reduce the amount of labour required by the Free State, and it has been estimated that about 80,000 natives will be wanted when all the 13 mines are in full production.

In the early stages of production the number of men who can be used underground will be restricted by the amount of development done: a big force can be used at relatively few stope faces. If there is to be a labour shortage, then, it may not become acute for 10 years or so, though the position may be getting progressively more difficult in the meantime, especially as more new mines are likely to be started during that period.

**Sources of Labour**

If a clear cut solution of the labour problem is sought, many obstacles are encountered. Within the Union secondary industry provides powerful competition for available South African labour. There are millions of natives in the adjoining territories. But those territories —particularly the Rhodesias—are themselves expanding industrially and will be drawing more heavily upon their own manpower resources in future.

There are, also, certain restrictions on the international movement of natives. A labour convention between Portuguese East Africa and the Union, for instance, strictly limits the use of Portuguese East African natives on South African gold mines. Recently a delicate position arose when it was found that 3,000 natives from that area had posed as Transvaal natives and obtained employment on the mines. An understanding between the Chamber of Mines and the Portuguese authorities allowed the natives to stay until the convention was suitably amended.

In nearly every territory governmental obstacles are imposed. In a report on the migration of native labour, Mr. W. Gemmill, general manager of the Witwatersrand Native Labour Association, said that in most cases obstacles were imposed openly, while in others verbal instructions were given to the chiefs to hinder the emigration of natives.

If the supply cannot be drawn from neighbouring territories, can it be taken from the less economic mines on the Rand? This, of course, would be an extremely bad solution. First, it must be assumed that the labour could be transferred. There is no compulsion upon either natives or Europeans to work in the mines, witness the seasonal influx and efflux to suit the peculiar requirements of native life.

Assuming, however, that the necessary labour was transferred, the short-term effect would be an increase in gold output because the new mines would yield a higher grade than the less economic mines on the Rand. From the long-term point of view, however, huge blocks of ore—at present payable—would be lost for good on the Rand, for the value of the ore would not justify the considerable expense of reopening closed mines and perhaps having to sink new shafts to reach the sections that could not be reopened for practical reasons.

Moreover, it was the low-grade mines that reaped the most benefit from the increase in the price of gold in 1949. If they were closed, not only would that benefit be thrown away, but so also would a large proportion of the benefit of any future increase in the gold price.

Some of the mines on the Rand might be forced to close down in the next 10 years, though it is unlikely that enough would close to supply the Free State's total labour needs. Indeed, it is sincerely to be hoped that such an unpleasant solution will not materialize.

There is clearly no simple answer to the problem. But, in spite of that, there seems a good chance on less tangible grounds that the Free State will obtain most, if not all, of the labour it needs.

The lure of the gold mines has always been strong in the native mind. While the Free State may seem unattractive at present it is capable within the next few years of producing an even stronger attraction to the right type of native than the Rand has done in the past.

In the first half of last year 20,000 natives entered

**The headgear and winder house at Welkom No. 1 shaft, which will be used to bring up some of the first year's gold production in the Free State. A portion of the reduction plant in course of construction can be seen on the left.**

Johannesburg in search of work. In mere numbers they represented in six months one-quarter of the Free State's total labour requirements. In practice, of course, not all of them would be suitable or willing to do underground work on the mines. In any case they were not seeking work in the Free State mines; they wanted to work in Johannesburg, and most of them were turned away because they had not secured the proper permission to seek work in an urban area.

But their journeys to Johannesburg indicated that there is still a big floating supply of labour. The problem, then, is to cause a voluntary diversion of that flow towards the Free State mines. This involves both increasing the attraction of the mines and telling the natives about it. The mines themselves are attending to the former requirement. Publicity to achieve the latter will probably have to be initiated by a vigorous campaign by the Chamber of Mines and the recruiting centres, with full inter-governmental co-operation. That is asking for a lot; but it is not impossible to achieve.

**Transforming the O.F.S.**

The attraction of the mines can be, and is being, increased almost beyond recognition. First, consider the appearance of the goldfield. At present it can be distinctly unpleasant. On calm days the scorching sun is difficult to avoid in the absence of natural shade, while on the frequent windy days clouds of fine brown sand sweep across the plains and along the, as yet, untarred roads.

One way in which this problem is being tackled is by a vast tree-planting programme. Tens of thousands of trees are now being planted. The township authorities are lining the streets and filling new parks with trees. In Welkom alone 15,000 trees have already been planted. A big nursery in the area will supply hundreds of thousands of trees, hedges, shrubs and flower seedlings, and each householder will be provided free with trees and shrubs. The same sort of thing is going on, or planned, in other mining areas of the Free State.

**Native shaft-sinkers in President Brand No. 1 shaft "lashing" broken rock into buckets at the bottom of the shaft to clear the way for a further round of drilling and blasting.**

In housing, the Free State mines are using their experience gained on the Rand, and making big improvements. European houses, instead of being erected in rather unattractive positions close to the shafts, are being laid out in accordance with modern town planning principles, with sports and other amenities at least equal to any established towns of equivalent size unconnected with mining. Virginia, for instance, which will serve the three existing mines in that area and probably a fourth mine to the north, will have 24 churches, 15 schools and generous sports facilities. The proposed town at Welkom has been described as the future "show piece" of South Africa. Subsidized by the companies, the European houses are let for extremely low rentals to mining employees.

With their long experience in taking good care of large numbers of natives, the mines are making a special effort in their Free State accommodation. For single natives the quarters will be much less crowded than the old compounds on the Rand, about half the number being accommodated to each room. Modern dining and ablution facilities are being provided, some mines favouring central heating and thermostatically-controlled shower baths and change rooms, and others coal stoves which they believe the natives prefer. (It can, of course, be very cold in the Free State in the winter.)

Accommodation for married natives ranges from orthodox houses (in which many Europeans of other countries would be glad to live) to native villages which bear some resemblance to the traditional tribal villages, apart from the fact that they are infinitely cleaner and more hygienic. Their appearance should have an important psychological effect in keeping the occupants happy.

Provision is being made for plenty of recreation for the natives, while the Anglo American group is spending £704,000 on a huge, modern hospital for native mine workers. Natives on the mines are given as much food as they can eat—which is considerably more than an average European could face—and they look extremely fit on the treatment given to them. All native housing, feeding and other amenities are absolutely free.

**Mechanization**

Another direction in which the mines are forestalling their labour problem is in mechanization and layout. The scope for mechanization may be limited in the Free State, one reason being the narrow reef widths and the desirability of avoiding the mining of undue widths of waste rock. Experiments are being made with new types of machinery, however, in order to determine the limits of their economic use.

One piece of equipment that will almost certainly be used in drilling for blasting is the mechanically-fed drilling machine fitted with a special trolley, known as "Jumbo." It has been estimated that development on the Free State mines may advance four to five times as fast as it has done on the Rand by the use of older methods, but definite plans cannot be completed until a certain amount of development has shown the conditions likely to be met. Shaft sinking has already been speeded up by time-saving methods. For instance, Merriespruit introduced an improved method of distributing concrete for lining the shaft walls. Part of the distributing equipment was mounted permanently on the Galloway stage and the previous delay in moving this equipment independently for blasting was avoided.

**Electric Power**

Against the labour problem the other needs of the mines seem less formidable. There was, however, recently a doubt expressed whether an adequate supply of electric power would be available in time to prevent a slowing

down of development and production in the Free State. In the opinion of a number of mining engineers in the Free State it was quite a big "if"; in the official view the "if" is either very small or non-existent.

Some mining engineers became concerned at the possibility that the Electricity Supply Commission might not succeed in expanding quickly enough to meet the rising demands of the new mines and surrounding industries. It was feared that a power shortage would cause major delays in developing the mines, and it was stated that the mines had been warned to keep their consumption to a minimum, even though no serious shortage has arisen yet.

The fears were based on the initial published programme of Escom to provide at the new Vierfontein power station five turbo-generators with a total capacity of 150,000 kW. It was pointed out that the existing 13 mines would use about 50 permanent winders in the initial production stage, and that those winders alone would consume about 150,000 kW. In addition there would be the other power needs of the mines as well as of the four goldfield towns and associated local industries. It was suggested that the gap between supply and demand, aggravated by difficulties of importing equipment, would increase considerably in the next 10 years, and that some of the mines might have to erect steam plant to meet part of their power needs.

**Welkom's reduction plant at an advanced stage of construction. The plant is expected to be ready for production about the middle of this year. The initial output of 50,000 tons is expected to be increased to about 100,000 tons in three years' time.**

These fears were answered by the chairman of Escom, Mr. A. M. Jacobs, in a statement to the local Press a few months back. He said: "Escom has on order for the Vierfontein power station not five but seven sets, rated 30,000 kW. each, with boiler plant and other equipment to correspond. The programme to which we are working is based on estimates of requirements made in full collaboration with the Chamber of Mines, and on such notifications of demands as have been presented to us from other quarters. Our contractors for equipment have repeatedly assured us that they will adhere to the promised dates of delivery. We cannot cater for, and should not be expected to cater for, takers of power of whose existence we are at present ignorant.

"Concerning the Rand, a gap has been created between demand and generating capacity, largely due to the unforeseen increase in demand following on the devaluation of our currency. The present supply of power to developing mines in the O.F.S. is given from stations which would normally feed power into the Rand network. The shortage of power is temporarily accentuated by delays in delivery of equipment, over which we have no control, for certain of our power stations.

"Nevertheless, we are hopeful that with the co-operation of all our consumers and the assistance we are expecting to secure from other power stations in the Transvaal, we shall alleviate any shortage in generating capacity which may occur, and enable the gold mining industry to maintain as far as possible full production and uninterrupted development of the new mines in the O.F.S. For the Taaibos power station we have 240,000 kW. of plant on order."

Escom is, in fact, to spend £54,000,000 on the expansion programme designed to meet all demands for power in the Union within two or three years. Vierfontein may eventually increase the number of 30,000 kW. sets to 10. Plans have been completed for the Taaibos power station (to be sited near Coalbrook, in the northern Free State), where the four 60,000 kW. sets are expected to be in operation within four years.

Early this year Escom announced that as an interim measure there would have to be a cut of 10 per cent in power consumption at peak periods. The effect of this announcement was really to spread to secondary industry a cut which had to some extent been practised by the gold mines on the Rand voluntarily during the preceding nine months by staggering their loads as far as possible and making temporary reductions in response to telephone requests.

Efforts are being made to minimize the effect of the cuts on the existing mines. By the time the Free State mines are needing a substantial supply of power it is expected that these interim difficulties will have passed.

**Water**

At present there is a water shortage in the Free State, but by concentrating available supplies for mining use, the chief sufferers are the town planners and domestic consumers. Before the supply was brought from the Vaal River the mines had to rely upon boreholes to obtain water, and while certain mines, notably Virginia and Merriespruit, are adequately supplied in that respect, there has been considerable anxiety about continuity of supply. Although large quantities of underground water are reported all too frequently by shaft sinkers, that ready-made supply does not answer the problem. In the first place, it is highly mineralized and quite unsuitable for use in its "raw" state. Secondly, it is estimated that rainfall in the area is insufficient to maintain the supply if large-scale use was made of it, which means that it would be uneconomic to provide plant to purify the water.

The Vaal River scheme is, of course, the answer, and already 1,750,000 gallons a day are being pumped from that source. But even this quantity is insufficient to provide more than minimum mining needs and highly restricted domestic use.

Like the power scheme, however, the water programme has been carefully based on the future needs of the area, and there is little doubt that, provided too many additional calls on the Vaal River are avoided, the supply will ultimately be adequate. The position should be eased somewhat in the first half of this year when the 24,000,000 gallon reservoir is complete near Welkom and the mines have finished the work of linking up with the

ring main. Then, if the programme keeps to schedule, the supply should gradually catch up with demand. By 1955 it is intended to supply 16,000,000 gallons a day; in ten years' time 25,000,000 gallons a day; and by the time all the mines are in production 64,000,000 gallons a day. There is no good reason to expect the programme to be delayed.

**Capital**

Capital is proving to be one of the least worries, despite much past anxiety on that score. Seven of the 13 mines have already secured, or have been assured of, sufficient capital to bring them to production. The mines are: St. Helena, Welkom, Virginia, Merriespruit, Freddies North, Freddies South and President Steyn. The ingenuity with which these mines have raised funds gives ground for believing that the remaining mines will not be at a loss for similar means. For instance, Virginia and Merriespruit tapped a quite unexpected source for about £5,000,000 when they obtained guaranteed working capital from the Kennecott Copper Corporation of the United States. For part of their needs the Freddies mines and President Steyn have made use of convertible notes or loan stock, bearing interest in the meantime and convertible into shares when the mines' prospects will be more clearly defined. Behind these note and loan stock issues, as well as the more usual share issues, are the powerful underwriting resources of the parent groups.

It is probable that the rest of the money needed to bring the remainder of the mines to production can be obtained on similar lines. Free State Geduld and Western Holdings have already made provision for most of the capital they need to reach production. Harmony has the concentrated resources of the Corner House group behind it, apart from the other companies interested in the area by reason of the land contributed to the mining lease. Loraine and Jeannette have behind them the underwriting resources of the Anglo American Corporation, which has already demonstrated its ability, either directly or through financial companies within the group, to obtain funds from London and the Continent—even interesting institutional investors, as Rand Selection succeeded in doing.

After the mines reach the production stage it should become a little easier to raise further working capital since investors will then see the attractions more clearly. While it is easy to make the issue sound unduly simple, there is little doubt in South Africa that the funds still needed by the mines will be forthcoming mainly from British and South African sources, with a possible intensification of the approach to American sources.

An indication of the importance attached to the London capital market is given by the firm decision of Consolidated Gold Fields not to follow the example of certain copper companies in migrating to the country where operations are carried out in order to escape heavy British taxation. The loss of direct contact with the capital market would, it is implied, outweigh the advantages from the taxation angle.

**Political Influences**

The fear that the Nationalist Government's policies would frighten away oversea capital supplies does not seem to have materialized to any great extent, or, at least, oversea investors have largely overcome their initial shock. The latest quarterly bulletin of statistics issued by the Reserve Bank showed that capital is still flowing into the country. It stated that "the total net inflow of capital last year was about £77,000,000, of which about £21,500,000 came from outside the sterling area, compared with a total of about £53,000,000 including only about £2,000,000 from outside the sterling area, in 1949. Of last year's total about £60,000,000 represented private capital."

Some of the internal policies, however, do not seem to have been framed with sufficient consideration for the importance of the mines to the country's economy. Successive increases in railway freight rates, for instance, helped the Railway Administration's budget at the expense of mining costs—thus conveniently passing the burden to a more efficient industry.

The Silicosis Amendment Act, 1950, too, added a burden to the mines which might have been shared by other sources of revenue. By increasing compensation to existing cases—highly commendable in itself—the Act placed an additional liability on the mines, which had made provision for silicosis payments on the previous scale. This retrospective burden is now having to be met from current working costs. No other industry has been subjected to retrospective legislation of that kind, and if there is to be any discrimination at all it should surely be in favour of the mines.

The much-discussed policy of apartheid is not likely to affect the mines directly unless it upsets relations between the various races very drastically. Residentially the Europeans and non-Europeans are already separated as far as practically possible, and there is a clear distinction between the work done by natives and Europeans. In fact, the Minister of Mines praised the housing arrangements on the Free State mines in which he foresaw "happy communities over a stretch of about 30 miles."

The idealistic view of apartheid taken by the Dutch Reformed Church, in which native labour in industry would gradually be replaced by Europeans, is clearly quite impracticable, especially on the mines, and there is no sign that any responsible member of the Government entertains such a notion.

In addition to their own problems, then, the new mines in the Free State will have to shoulder some of the same kind of burdens already assumed by the older mines on the Rand. But they show every sign of being able to stand the strain.

# Consolidated Gold Fields of South Africa Ltd.

THE history of the Consolidated Gold Fields spans the era of the mining-finance house which has evolved in the past 60 years or so. The company is the senior member of the half-dozen powerful mining groups which have made history in South Africa. It has under its aegis some of the old-time gold producers which originally started up when Johannesburg was a mere dorp and the surrounding country a camp for those who had trekked from afar to find fortune in the Witwatersrand's hidden wealth.

The present company is the successor of a comparatively small undertaking formed by Cecil Rhodes and C. D. Rudd in the Victorian era. The object was specifically to associate itself with the formation and development of gold mines in South Africa. But since those early days big developments have taken place and the Gold Fields, seeing its opportunity for expansion both in other mining fields and in commercial enterprises, formed in 1919 the New Consolidated Gold Fields Ltd., through which it is to-day interested in commercial and manufacturing enterprises as well as in mining in four continents. Its span of mining interests embraces America, Australia, Canada, Colombia, Rhodesia and West Africa.

All this, of course, is in addition to its principal mining achievements which lie in the opening up of the Far Western Rand. This started in 1925 just after the successful application of cementation on the Rand to shaft sinking through water-bearing ground. The possibilities of the Main Reef Group series being found in the Far Western Rand were brought to the company's notice. Geological opinion was at first discouraging but Dr. Krahmann, experimenting with the then new magnetometric methods of geophysics, traced the magnetite bearing shales and with them, by inference, the Main Reef Group of the Upper Witwatersrand system below a covering of younger rocks. This was brought to the notice of the Gold Fields Consulting Engineer, the late Carleton Jones, by Dr. Reinecke and a great exploration programme began.

The success of these early operations resulted in the formation of West Witwatersrand Areas Ltd. to take up a large area of ground and embark upon a drilling programme. Payable gold-bearing reef was found which led to the gradual formation of mining companies to work specific areas. In all, five operating companies have been formed.

A very satisfactory increase in revenue was shown by the company for the year ended June 30, 1950. Earnings of the wholly-owned subsidiary, New Consolidated Gold Fields, from which the parent company's total income is derived, showed an increase. Net profits of the group amounted to £1,744,450 (against £1,361,449). This figure included £1,007,925 (against £729,729) from dividends and interest, and an amount of £114,226 (against £141,258) representing recoveries in respect of previous years. Taxation called for more at £752,970. An amount of £120,000 was again allocated to depreciation reserves and £219,500 to general reserves. Excluding the small portion due to outside shareholders, the net balance of the group profits for the year was £570,395. The consolidated balance sheet showed investments aggregating £10,769,086 which was rather more than in the previous year, and their market value was said to be in excess of this figure, though the exact value is not ascertainable. The group holds large amounts of American and South African Government securities at £2,417,727; cash stands at £2,618,492. Current assets totalled £13,037,827 and current liabilities £10,851,333.

For the eighth successive year the Gold Fields paid a dividend of 12½ per cent (2s. 6d. per share).

The remainder of this article is devoted to some account of the latest achievements of the Gold Fields' more important interests and associated companies, while on the next page will be found a table summarizing the mining results and profits over the past two years of those Rand producers comprised in the Group.

## ORANGE FREE STATE INTERESTS

Interesting results have been obtained by prospecting and drilling carried on by the New Consolidated Free State, Exploration Co. Ltd., which undertaking was formed by the Gold Fields to take over its interests in the Orange Free State. Excellent results were obtained on that part of the farm La Riviera on which the company held the mineral rights and this area was incorporated in the Harmony mining lease area. As a result the company has acquired an interest in this area by way of vendor consideration.

In other directions its interests have expanded, and it has continued its prospecting activities by drilling both in the areas, of which the mineral rights have been purchased, and in the more extensive blocks of ground under option.

Interesting results have been obtained in boreholes on the farm Saaiplaas which has been drilled by the company on joint account with African and European and Union Free State Mining, and further drilling is in progress. The area is a potentially valuable asset and may form the nucleus of a mining company.

The New Consolidated Free State Exploration Co. holds mineral rights on approximately 25,600 acres with options on a further 239,000 acres. Since its formation it has examined over 1,900,000 acres and done 332,567 ft. of diamond drilling.

The Gold Fields holdings in Orange Free State mining companies have increased considerably and now comprise nearly one-quarter of its holdings in gold shares.

## SUB NIGEL LTD.

Although Sub Nigel goes back to the early days of 1895 when but small interest was given to the Far Eastern Rand, as a producer in its present form it dates back from 1909. The mine's reef formation occurs in rich narrow shoots and as a consequence extensive development is necessary and sorting is a main operation before the ore is treated.

The mine is one of those which did not derive major benefits from the higher price for gold following devaluation so far as its ore reserves are concerned, and its present tonnage is well below that of two years ago.

During its career to June 30, 1950, a total of 16,389,918 tons of ore have been milled, giving a yield of 10,492,848 oz. gold, while the net profit from operations during this period amounted to £43,771,352. Dividends paid reached the figure of £22,472,355. For the year ended June 30, 1950, a working profit of £2,299,266 was made, compared with £1,558,602 the previous year. After deducting sundry expenditure and other items, an amount of £2,222,259 was left. Taxation called for £1,078,468 while the small amount of £29,184 was transferred to general reserve; dividends totalling 12s. per share absorbed £1,063,126. Particulars of operations over the past two years are shown in the table on the next page.

Of the footage developed during the year, 36,800 ft. were sampled, of which 10,780 ft. proved payable with an average value of 10.6 dwt. per ton over an estimated stoping width of 36.5 in.

The policy of opening up old areas of the mine by means of exploratory stoping and development is making steady progress and continues to yield satisfactory tonnages of low grade ore.

## ROBINSON DEEP LTD.

The property of Robinson Deep is situated on the Central Rand and has for its neighbours Crown Mines and City Deep. It has been working in its present form for some 36 years but the original company started in the early days of the Rand. The mine is very deep—some of its workings being a mile and a half below surface.

Since the commencement of operations to the end of 1950, the tonnage crushed has amounted to 37,819,000 tons of ore for a yield of 9,422,103 oz. gold, and a working profit of £16,090,888. Dividends paid, with the redemption of the "A" shares have amounted to £8,076,162.

During the year to December 31, 1950, the company made a net profit of £436,922 compared with £271,947 the previous year. The dividend was raised to 2s. 6d. against 2s. the previous year, which cost £250,000. Taxation called for £111,100 and an amount of £41,897 was carried forward. Mining operations over the past two years are summarized in the table on the next page.

Mining operations are being carried out under increasingly difficult conditions having regard to the depth of the workings, and the problems of ventilation and support of hanging walls. A high and steady milling rate is necessary to ensure a continuance of normal operations.

Of the development footage, that sampled amounted to 15,930 ft., of which 8,515 ft., equal to 53.5 per cent proved payable of an average value of 4.8 dwt. per ton over an estimated stoping width of 57.8 in.

The fully developed ore reserves at end-December, 1950, totalled 3,384,000, averaging 3.8 dwt. over an estimated stoping width of 56 in. Compared with the previous year they showed a decrease of 443,000 tons of the same value.

### SIMMER & JACK MINES LTD.

The present Simmer & Jack Mine is the successor of one of the oldest on the Rand. The company is nowadays working a much larger area, which, however, includes the original mine. Since milling started in 1888, up to the end of 1950, the tonnage crushed has amounted to 50,014,186 tons for a yield of 11,979,625 oz. of gold, while working profit has aggregated £16,778,153. The company now working, which was registered in 1924, has made total working profits of £9,283,963 and distributed in dividends £3,653,125 while it has paid out in taxation and the State's share of profits, £2,349,453.

During the year ended December 31, 1950, net profit amounted to £489,808 against £264,564. This enabled the dividend to be increased from 6d. to 8d. per share, which called for £225,000. Taxation and State's Share of Profits amounted to £22,220, and £69,511 was carried forward. A summary of mining operations is shown in the table.

As a result of devaluation, large tonnages of previously unprofitable ore in the upper levels became payable. Mining operations can now be concentrated to better advantage in the upper areas, and work in the lower eastern portion of the mine temporarily suspended. This has improved the ventilation conditions, but has temporarily excluded a tonnage of ore reserves in the lower eastern section.

At the end of December, 1950, ore reserves were estimated at 3,005,000 of 3.8 dwt. over a stoping width of 48.1 in. This compared with the previous year's total of 3,725,000 tons—a decrease of 720,000 tons but of the same value.

### VOGELSTRUISBULT GOLD MINING AREAS LTD.

The mining area of Vogelstruisbult is well positioned to the north of the rich Sub Nigel Mine and this, together with the success of its northern neighbours—Springs and Daggafontein—gave promise of good returns from the outset. It has not disappointed so far and prospects continue to be bright. Development has now been spread over the eastern, central and western section of the property and the Kimberley reef horizon has been well tested. From the No. 3 Shaft, which has been sunk to its final depth of 6,662 ft., a connection has been made with Sub Nigel.

The net profit for the year to December 31, 1950, was £1,027,890 compared with £664,382. The dividend was increased from 1s. 2d. to 1s. 10½d. per share, which called for £471,429. The amount required for taxation was £398,937 as against £199,596. An amount of £166,243 was transferred to general reserve. There was no balance carried forward. Mining operations over the past two years are summarized in the table on this page.

Ore reserves at end-December, 1950, amounted to 3,097,000 tons, averaging 5.5 dwt. over an estimated stoping width of 41.2 in. Compared with the previous year they showed an increase of 240,000 tons and 0.2 dwt. in value.

### LUIPAARDS VLEI ESTATE & MINING CO. LTD.

Formed towards the end of last century, this mining undertaking has become one of the most successful of the Rand producers. It is positioned towards the western end of the field adjoining West Rand Consolidated. The old reduction plant has given good service but by last year had deteriorated to the point where considerable expenditure would be required to keep it in commission; and it was accordingly decided to expand the newer Turk shaft plant to 110,000 tons monthly capacity and thereafter to close down the old plant. The capital cost is to be incurred during the current and succeeding years. It is expected that not only will extraction be improved but there will be a considerable saving in reduction costs.

Since the commencement of operations up to June 30, 1950, the mill has dealt with 20,852,439 tons for a working profit of £6,927,281, while dividends paid have aggregated £3,647,969. During the year to June 30, 1950, the tonnage dealt with was again stepped up, and amounted to 1,235,000 tons. Revenue was up to 45s. 10.3d. per ton against 34s. 0.5d. per ton, but costs increased to 30s. 1.9d. per ton as against 27s. 8.3d. Working profit per ton was more than doubled at 15s. 8.4d.; the total coming out at £969,225 compared with £383,447 the previous year. Dividends of 2s. per share were paid against 1s. 3d.

Mining results are summarized in the table on this page. A slightly larger development footage was accomplished and the pay ratio was 66.5 per cent as against 65 per cent. The programme of diamond drilling to test the potentialities of the Bird Reef was completed during the year after values had proved disappointing, but further exploration of this reef horizon is being pursued.

Ore reserves were again increased last year by 450,000 tons to 3,102,000 tons, value 4.3 dwt. (a decrease of 0.5 dwt.) over a width of 49.1 in.

The company retains a large area on farm Luipaardsvlei.

### RIETFONTEIN CONSOLIDATED MINES LTD.

Although one of the smaller undertakings of the Group, which does not attract much attention, Rietfontein has had a satisfactory career since it was formed in 1934. It is somewhat isolated from the other mines, being positioned to the north of the Knight's property. Since its commencement it has milled 4,901,928 tons of ore for a working profit of £2,781,760 and has paid £1,280,771 in dividends.

The company's profit last year of £385,003 was the highest yet recorded as likewise was the profit per ton of 24s. 1d. Yield was 4.336 dwt. and the revenue rose to 54s. 9.7d. as against 44s. 8.8d. the previous year. The rise in working costs of 4s. 3d. per ton to 30s. 8.9d. was comfortably met by the additional revenue. Dividends amounted to 3s. 3d. as against 2s. 3d.

Mining results over the past two years are summarized in the table on this page. Development results were satisfactory and of the 8,570 ft. sampled 38.7 per cent proved payable at a value of 8.1 dwt. per ton.

Some time ago a policy was inaugurated of reclamation, exploratory development and stoping in the upper levels of the mine and in the old eastern section. This has been continued with gratifying results.

### VLAKFONTEIN GOLD MINING CO. LTD.

The formation of Vlakfontein took place in 1934 after the freehold of the farm of a similar name had been acquired from the Lace Proprietary Mines. The mine adjoins the Sub Nigel on the latter's western boundary but there is no neighbour to the east although it is on the eastern section of the property where major development work has been undertaken. Although the company dates from 1934, milling did not start until 1942, since when up to the end of 1950 a total of 2,765,500 tons have been dealt with, for a working profit of £3,419,481. Dividends paid have amounted to £1,975,000.

During 1950 the mill dealt with 419,000 tons for a working

**OPERATING RESULTS FOR THE GROUP'S PRODUCING MINES ON THE RAND**

| Company | Year Ending | Mill (000 tons) | Total Yield (f.oz.) | Yield (dwt./ton) | Revenue (shill./ton) | Working Costs (shill./ton) | Working Profit (shill./ton) | Development (feet) | Available Ore Reserves: Tons (000) | Value (dwt.) | Width (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub Nigel Ltd. | 30/6/49 | 796 | 351,276 | 8.83 | 76s. 5d. | 37s. 3d. | 39s. 2d. | 39,589 | 2,130 | 9.7 | 34.7 |
| | 30/6/50 | 797 | 330,572 | 8.29 | 99s. 2d. | 41s. 6d. | 57s. 8d. | 43,948 | 2,271 | 8.4 | 34.9 |
| Robinson Deep Ltd. | 31/12/49 | 1,322 | 238,205 | 3.60 | 36s. 3d. | 32s. 9d. | 3s. 6d. | 23,169 | 3,827 | 3.8 | 55.9 |
| | 31/12/50 | 1,385 | 227,235 | 3.28 | 41s. 6d. | 34s. 11d. | 6s. 7d. | 23,047 | 3,384 | 3.8 | 56.0 |
| Simmer & Jack Mines Ltd. | 31/12/49 | 1,490 | 261,842 | 3.51 | 35s. 5d. | 30s. 5d. | 5s. 0d. | 58,689 | 3,725 | 3.8 | 49.1 |
| | 31/12/50 | 1,488 | 238,539 | 3.21 | 40s. 6d. | 33s. 10d. | 6s. 8d. | 51,252 | 3,005 | 3.8 | 48.1 |
| Vogelstruisbult Gold Mining Areas Ltd. | 31/12/49 | 896 | 223,329 | 4.99 | 50s. 1d. | 33s. 5d. | 16s. 8d. | 54,932 | 2,857 | 5.3 | 41.1 |
| | 31/12/50 | 894 | 218,880 | 4.90 | 62s. 0d. | 38s. 5d. | 23s. 7d. | 52,734 | 3,097 | 5.5 | 41.2 |
| Luipaards Vlei Estate & Mining Co. Ltd. | 30/6/49 | 1,208 | 237,642 | 3.93 | 34s. 0d. | 27s. 8d. | 6s. 4d. | 58,413 | 2,652 | 4.8 | 47.3 |
| | 30/6/50 | 1,235 | 232,716 | 3.77 | 45s. 10d. | 30s. 2d. | 15s. 8d. | 58,943 | 3,102 | 4.3 | 49.1 |
| Rietfontein Cons. Mines Ltd. | 31/12/49 | 320 | 70,496 | 4.41 | 44s. 9d. | 26s. 6d. | 18s. 3d. | 22,194 | 660 | 5.2 | 54.7 |
| | 31/12/50 | 324 | 70,239 | 4.34 | 54s. 10d. | 30s. 9d. | 24s. 1d. | 21,247 | 607 | 5.3 | 52.4 |
| Vlakfontein Gold Mining Co. Ltd. | 31/12/49 | 417 | 161,702 | 7.75 | 78s. 4d. | 47s. 8d. | 30s. 8d. | 45,701 | 1,228 | 9.0 | 40.5 |
| | 31/12/50 | 419 | 155,781 | 7.44 | 93s. 11d. | 49s. 11d. | 43s. 11d. | 44,752 | 1,245 | 8.9 | 40.5 |
| Venterspost Gold Mining Co. Ltd. | 30/6/49 | 1,308 | 277,585 | 4.24 | 36s. 9d. | 28s. 3d. | 8s. 6d. | 59,653 | 2,654 | 5.4 | 62.2 |
| | 30/6/50 | 1,315 | 280,056 | 4.26 | 51s. 6d. | 31s. 11d. | 19s. 7d. | 66,488 | 3,132 | 5.1 | 59.1 |
| Libanon Gold Mining Co. Ltd. | 30/6/49 (4 months only) | 263 | 40,977 | 3.12 | 26s. 11d. | 24s. 8d. | 2s. 3d. | 11,588 (12 months period) | 1,833 | 4.4 | 62.2 |
| | 30/6/50 | 894 | 150,338 | 3.36 | 40s. 1d. | 28s. 5d. | 11s. 8d. | 40,622 | 1,946 | 4.2 | 60.2 |

profit of £920,224 against £640,497. Taxation called for £135,038 and the dividend, increased from 1s. 6d. to 2s. per share, absorbed £600,000. Mining results are compared in the table below.

A new shaft is being put down to serve the western portion of the mine; headgear and winders are due for delivery this year and sinking will be started.

Ore reserves at the end of December, 1950, were increased by 17,000 tons to 1,245,000 of 8.9 dwt. over a stoping width of 40.5 in. The value was lower by 0.1 dwt.

### WEST WITWATERSRAND AREAS

Two decades have passed since the West Wits came into existence. The exploratory work carried out by this company has resulted in a big extension westward of the Rand gold belt and the formation of five large gold mining undertakings. Three have been brought to the production stage—Blyvoor in the Central Mining-Rand Mines Group, and Venterspost and Libanon under the control of the Gold Fields; the remaining two, Doornfontein and West Driefontein are still in the developing stage. The latter has, so far, given evidence of containing the rich Carbon Leader, yielding 100 per cent payability, already found in the Blyvoor Mine. No decision has yet been made regarding the advisability of applying for a mining lease in respect of the area west of Doornfontein or the launching of another company.

Meantime West Wits has retained its large shareholdings in these companies and during the year ended June 30, 1950, received by way of dividends an amount of £511,716. Its investments stand in the balance sheet at £6,158,533, but the market value is over £20,000,000.

Property holdings stand in the balance sheet at £751,121, and stores £15,309, while cash assets at £658,498 compare with current liabilities of £491,823. Valuable township and surface rights are held, and there are interesting possibilities of participation in the large ultra-deep areas.

The company's last report contained, as usual, a wealth of information with regard to mineral rights held and the result of exploratory work done. Conjoint drilling results were also given together with interesting statistical information.

An extensive and confident review of the various interests of the company and of the Rand mining industry as a whole was given by the chairman, Mr. S. R. Fleischer, at the annual meeting in Johannesburg in November of last year.

### VENTERSPOST GOLD MINING CO. LTD.

Venterspost was the first of the mines on the West Wits line to start milling, production commencing towards the end of 1939. In order to deal with additional low grade tonnage made payable by devaluation, it is proposed to increase milling by 25,000 tons to 135,000 tons a month.

For the year to June 30, 1950, a working profit of £1,290,044 was made. Sundry expenditure exceeded sundry revenue by £98,364 but after adding the unappropriated amount at the commencement of the year (£133,713), there was a total of £1,325,393. Taxation called for £258,505, while £355,000 was transferred to general reserve and dividends of 2s. 8d. per share absorbed £653,334, leaving £58,554 to be carried forward.

Mining results over the past two years are shown in the table. Development footage increased and of the 26,790 ft. sampled, 57.6 per cent proved payable.

Efforts to control and reduce the quantity of water made underground have continued, and work on the scheme of canalizing the flood waters from the Wonderfontein spruit across the area between the Venterspost and Gemsbokfontein dykes was completed during the year.

Ore reserves at June 30, 1950, were estimated at 3,132,000 tons, averaging 5.1 dwt. over a stoping width of 59.1 in.

### LIBANON GOLD MINING CO. LTD.

The report of Libanon to June 30, 1950, gave the first full year's results since the mill started up in March, 1949. In the early part of the year the fourth unit of the reduction plant was completed and brought into commission.

For the year to end-June last the working profit amounted to £521,278 and after deducting £41,112, being the difference between sundry items of expenditure and revenue, there remained a net profit of £480,166. With the company still receiving amortization relief, taxation called for the small sum of £69 and an amount of £480,159 was transferred to general reserve.

The mine, operating results for which are summarized in the table, has one of the best milling plants on the Rand; its rated capacity is 100,000 tons monthly, but labour shortage and the development position have so far prevented all-out milling. It has now been decided to step up to 85,000 tons and to gradually increase to 90,000 tons monthly, such increases being dependent upon an adequate supply of labour.

The footage sampled on the Main Reef last year amounted to 13,580 ft., of which 55.8 per cent proved payable, of an average value of 5.6 dwt. per ton.

In order to open up the lower levels of the mine east of No. 1 Shaft, it has been decided to sink a sub-vertical shaft to the 26 Level horizon.

### DOORNFONTEIN GOLD MINING CO. LTD.

The Doornfontein property is situated to the extreme west of the West Wits line and for this reason has attracted much interest. It adjoins the western boundary of Blyvoor and boreholes on the eastern portion of Doornfontein have shown that it carries the Main Reef and Carbon Leader.

Two shafts are being sunk and at June 30, 1950, the Annan shaft had reached a depth of 3,691 ft., while the No. 1 Shaft was temporarily suspended at a depth of 1,000 ft.

It was towards the end of last year that the good news was received of the Annan shaft reaching the Carbon Leader horizon. This zone was reached at 4,151 ft. and consisted of three bands. The top band gave an average of 2.2 dwt. over 12.6 in. (28 in.-dwt.); the middle band 0.8 dwt. over 7.90 in. (6 in.-dwt.); and five sections sampled of the third band gave an average value of 43.5 dwt. over 24.2 in. (1,052 in.-dwt.).

Although some doubt exists regarding the bottom band of the series, it is thought probable that this may be a split from the characteristic Carbon Leader of the area or may even prove to be a new gold-bearing horizon. But whatever be the case, a wide band carrying high values, as the chairman has remarked, is what matters.

It has been decided to suspend sinking operations after the Annan shaft has reached the 5th level and to crosscut from that level to the Carbon Leader zone.

It is expected that the 10,000 tons a month pilot plant will be completed during the latter part of 1952.

### WEST DRIEFONTEIN GOLD MINING CO. LTD.

The good things said about West Driefontein have shown themselves to be fully justified. The property has always been highly regarded and boreholes have indicated that it is underlain by the Carbon Leader which has proved to be so profitable in the adjoining Blyvoor mine. It is from this latter company's No. 2 level that underground work in West Driefontein has been pushed forward. A drive has been extended from that level into the property of West Driefontein and although for the year ended June 30, 1950, only a comparatively small amount of reef development was done, subsequent work has given excellent results. The drive was stopped at the end of November of last year and the total amount of reef sampled up to that date from the time the boundary was crossed was 2,000 ft., all of which was payable, averaging 67.3 dwt. over 11.6 in. or 781 in.-dwt.

The Carbon Leader was struck in the mine's No. 2 Shaft towards the end of last year at a depth of 4,415 ft. Owing to the intrusion of a dyke only a small exposure was at first obtained and in order to obtain adequate exposure, a drive was put in from the shaft and samples assayed gave values equivalent to 1,075 in.-dwt.

Preparations are being made for the development of the No. 12 level, from the No. 2 Shaft. The mine will eventually be opened up by four shafts altogether and the first unit of the reduction plant with a capacity of 25,000 tons a month is expected to start up before the end of 1951.

In March of this year the Carbon Leader was struck in No. 1 Shaft at 3,797 ft. Assays of samples taken around the periphery of the shaft showed that the gold content averaged 110.1 dwt. per ton of an average width of 11.2 in., equivalent to 1,233 in.-dwt.

### MOTAPA GOLD MINING CO. LTD.

The property of the Motapa Gold Mining Co. is situated in the Bubi district of Southern Rhodesia. It is a comparatively young undertaking, having been floated by the Gold Fields Rhodesian Development Co. about four years ago.

Two shafts have been sunk on the property, and the plant with a capacity of 25,000 tons a month, started up in 1948.

The mine is divided into two sections—the B & S Claims and the Fossicker Claims. A considerable amount of work was done by the previous owners and the Motapa Co. has continued with development which has given satisfactory results. A fair amount of ore has been opened up and the reserves were last computed at 386,000 tons averaging 3.3 dwt. per ton over a stoping width of 14.3 ft. The ore bodies are remarkably wide but of low grade.

Additional claims have been pegged and registered in the company's name; the major portion of them representing the mining area of the Calcite mine situated approximately 2½ miles to the north of Motapa.

While operating results have been satisfactory, the complex nature of the ore has created metallurgical difficulties and these are being studied by the Company's engineers.

For the year ended December, 1950, the mill dealt with 253,350 tons, yielding 27,709 oz. gold, equal to 2.187 dwt. per ton. Working profit was £88,061 and the profit per ton 6s. 11.4d. The footage advanced during the year totalled 16,054 ft.; that proved on the strike of the ore bodies amounted to 6,655 ft., of which 2,765 ft. was payable at an average value of 3.0 dwt. per ton over a width of 9.7 ft.

## WANDERER CONSOLIDATED GOLD MINES

Owing to shortage of labour, the plant at the Wanderer Consolidated has not been able to work at full capacity, and in spite of efforts to stimulate recruiting, labour has continued to decrease. This, with other causes, has affected costs which have risen to such a point that, notwithstanding the higher price for gold, over half the developed ore in the mine was found to be no longer payable.

After a careful review of all the conditions by the Consulting Engineers, the directors have reluctantly come to the conclusion that profitable working is no longer possible. They propose therefore to extract all the remaining payable ore and thereafter to cease mining operations and in due course to realize on the equipment and assets of the Company.

In its day Wanderer has been a handsome dividend-payer. It was formed in 1928 and started to make distributions in 1933. For some time the mine had been working on a very small margin and development work on the Ashton, Trinity and Wanderer sections have been disappointing. It was indeed a notable achievement for the mine to continue on a profit-earning basis considering that the mill feed of the ore was of the exceptionally low grade of 1.9 dwt.

## LAKE VIEW & STAR LTD.

This is the doyen of the Western Australian mining undertakings working on the Golden Mile. It has, since its start over 40 years ago, greatly extended its leases and this large property now includes Ivanhoe Gold, Lake View Consols, and Hannan's Star.

Operations have continued to be successful and the Report for the year to June 30, 1950, disclosed many encouraging features. The tonnage treated totalled 583,946 tons which showed an increase of 32,755 tons as compared with the previous year and yielded 123,713 oz. gold, the head value being a trifle lower at 4.76 dwt. Working costs showed an increase to 30s. 9d., mainly due to increases in the basic wage and the industry allowance, adjustments to piece-workers' rates and the higher cost of consumable stores.

The mining revenue for the year amounted to £1,508,101 against £1,163,586. The profit from mining operations of £567,120 was approximately £236,000 higher than the previous year and enabled the dividend to be stepped up from 2s. to 2s. 6d. per share.

The footage of development work was rather less than previously, being 17,500 ft., while of the 9,424 ft. driven on the lode channels, 65.8 per cent proved payable averaging 5.4 dwt. over a width of 56 in.

Ore reserves have been further built up to 4,292,400 tons, equal to seven years mill feed. Their value is somewhat lower—4.77 dwt. as lower-grade material has been brought within the margin of payability.

The company now holds a two-thirds interest in Porphyry Gold Mine, the remaining interest being held by Gold Fields Australian Development. Owing to current labour difficulties this mine is to be placed on a care and maintenance basis for the time being.

## LAKE GEORGE MINING CORPORATION LTD.

The high prices ruling for base metals has focused much attention to this Corporation which owns the entire capital of Lake George Mines Pty Ltd., from which it receives its income. The property is situated some 35 miles from the Australian capital of Canberra, and produces zinc, lead, copper and pyrites, the two first-named metals being the most important revenue earners.

The year to June 30, 1950, was a much happier one for Lake George as the previous period was marred by a disastrous strike which limited mill operations to 80 days and mine working to 67. The group profits amounted to £498,813 which compared with £324,843 previously. These profits were earned in less than 12 months working as, because of strike and power restrictions, operations were not resumed until August, 1949.

The metal contents of concentrates produced were: lead 6,545 tons (against 1,698 tons); zinc 11,190 tons compared with 2,837; copper 738 tons as against 180 tons; silver 156,393 oz. (44,203 oz.); and gold 3,921 oz. compared with 1,139 oz. the previous year. The combined revenue to be received from the sale of these metals in the current year will be enhanced by the further increase which has taken place in prices. Concentrates last year realized £1,230,250 and mine expenditure was £724,764.

Operating costs have continued to rise owing to increase in basic wages and the new awards made by the Arbitration Court which, in turn, have raised the cost of plant, equipment and stores.

The company paid a maiden dividend of 1s. per share last year and a final of 1s. in January of this year. It has recently declared an interim of 1s. 6d. per share for the year ended June 30, 1951.

On the technical side the position at the Lake George property is satisfactory. The underground workings have been fully re-mapped geologically and considerable diamond drilling has been done. A massive pyrite body, which is associated with lead and zinc lode in some parts of the mine, and which carries some copper, is being investigated. Outcrops at the mine are very widespread and there is a region of base metal deposition rather than isolated occurrences of lead-zinc-copper lode. The large area held by the company is believed to hold out further good prospects.

Ore reserves amount to 1,539,536 tons or over ten years supply for the mill.

Operations continue at a satisfactory level, and for 40 weeks ended April 8, 1951, 130,485 tons of ore were milled at Captain's Flat. The output of concentrates for the same period amounted to 10,679 tons of lead concentrates, 19,050 tons of zinc concentrates and 3,094 tons of copper concentrates.

## INDIAN COPPER CORPORATION LTD.

The property of the Indian Copper Corporation, which is situated in the Singhbhum district of Bihar, India, consists of mining leases over 24,089 acres and 441 acres of surface rights. Three mines have been worked—the Mosaboni, Badia and Dhobani. Development at the latter has practically ceased and it is on the Mosaboni that operations are mainly concentrated. A new shaft is being sunk and was last reported to have reached a depth of 539 ft. from the collar level.

The surface works have been enlarged, a 4-high cold rolling mill being installed and a new turbo alternator put into operation. The mine has its own generating units and machinery for concentrating, smelting and refining together with a brass foundry. During its 25 years working it has gradually assembled all the plant necessary for carrying on mining, milling and refining operations. It is the only enterprise of its kind in India.

During 1949 the mill treated 352,272 s.tons, producing 28,180 short dry tons of concentrates of an average value of 24.849 per cent copper. The grade of the ore averaged 2.047 per cent copper and the overall recovery was 94.099 per cent. Production of refined copper amounted to 6,390 l.tons, while the output of rolled metal from the brass foundry and rolling mill was 9,921 l.tons.

Operating profit amounted to £593,552 compared with £744,931 for the previous year. Taxation called for £343,000; an amount of £100,000 was allocated to General Reserve and the maintained dividend of 12½ per cent, absorbed £62,851.

Although labour and other shortages were encountered, results were regarded as satisfactory, but the modest increase in the tonnage treated still did not bring output up to mill capacity. Despite difficulties, mining, milling and smelting costs fell slightly. Mine development gave noticeable improvement and although the footage driven was rather lower, the payability jumped to 58.1 per cent averaging 2.8 per cent copper over a stoping width of 68 in. compared with 29.6 per cent averaging 2.75 per cent over 52 in. This improvement, which is attributable mainly to the rich ore shoot in the North Badia Section of Mosaboni mine, is the explanation of the further strengthening of the ore reserves which now figure at 2,798,430 s.tons of 2.52 per cent copper.

For the year ended December 31, 1950, 386,156 s.tons of ore were milled, producing 6,614 l.tons of refined copper, while the output of rolled metal from the brass foundry and rolling mill was 8,042 l.tons.

## CAMP BIRD LTD.

Apart from the Camp Bird mine in the United States, which is still being worked on a royalty basis, the assets of Camp Bird Ltd., consist of holdings in mining undertakings. Thus it is now a mining-finance company, deriving its revenue from dividends and share dealings. Its total income from these sources for the year to December 31, 1950, amounted to £212,653 and after providing for administration and sundry expenses, there remained a profit of £197,663. Taxation called for £69,380, Investment Reserve £65,000, and for the sixth successive year the dividend was maintained at 10 per cent absorbing £59,782.

The company's quoted investments stand in the balance sheet at £1,188,756 and in addition there are unquoted holdings of £122,586. The market value of quoted securities while not exactly ascertainable, is in excess of the amount shown. Current assets Cash at Bankers and Debtors were £167,164 and current liabilities figure at £150,196.

The portfolio of investments shows a spread in Rand gold producing and developing mines, together with some promising O.F.S. and Rhodesian shares. Included in these are holdings in the West Witwatersrand Area Ltd., Blyvoor Ltd., Doornfontein Ltd., West Driefontein Ltd., and New Consolidated Free State Exploration Co. Ltd. In Southern Rhodesia, the Company is interested in Motapa Gold Mining Co. Ltd., while its Mexican interests include Durango Timber Ltd. and The Fresnillo Co., which, apart from working a lead-zinc property, is interested in other mining enterprises in Mexico and U.S.A. In Australia the Camp Bird has substantial investments in Lake George Mining Corporation Ltd. and Lake View & Star Ltd.

Based on book values the categories of the Company's investments were 63% in gold and platinum mining, 17% in silver and base metals and 20% in miscellaneous. Their geographical distribution is South Africa 63%, Australia 11%, America 11%, and elsewhere 15%.

# Anglo American Corporation of S. Africa

ALTHOUGH a comparatively late-comer to the South African scene, the Anglo American Corporation has, since its formation in 1917, established itself as one of the leading mining undertakings of the Empire. In the past 33 years it has built up assets aggregating over £20,000,000, representing participation in mining undertakings throughout Southern Africa.

## DIAMOND INTERESTS

While the name of the Anglo American is associated pre-eminently with the South African gold mining industry, it has from the outset been closely connected with the diamond industry, and through its control of the Anglo American Investment Trust, formed in 1936, has big holdings in all the principal South African diamond mines.

The Trust itself has a 75 per cent holding in the Deferred Ordinary shares of De Beers Consolidated Mines, which are issued to the extent of £4,000,000, the remainder of the company's issued capital being £2,000,000 in the form of 40 per cent Cumulative Preference shares. Since devaluation there has been sustained demand for diamonds, which is reflected in a net profit (after tax) for De Beers in 1950 of £7,880,684—an increase of £2,189,116 over 1949. Dividend payments on the Deferred shares amounted to 110 per cent compared with 90 per cent in the preceding year, against earnings, after payment of the Preference dividend, of 162 per cent.

De Beers is producing diamonds on a large scale from two of its mines in Kimberley, as well as from alluvial deposits at Kleinzee in Namaqualand, and the Jagersfontein Mine in the O.F.S. The company also holds about 90 per cent of the share capital both of the Consolidated Diamond Mines of South West Africa and of the Premier (Transvaal) Diamond Mining Co. Total output of diamonds from all these companies last year amounted to 1,914,021 ct., of which De Beers produced 44 per cent, Premier (Transvaal) 36 per cent, and Consolidated Diamond Mines 20 per cent.

De Beers, jointly with the Consolidated Diamond Mines of South West Africa and the South-West Finance Corporation, also own the whole share capital of the Diamond Corporation, which is the link between the South African Diamond Producers' Association and diamond producers in other countries, and has contracts with all the principal non-Union producers for the purchase of their production. This arrangement enables something like 95 per cent of the world's diamond output to be marketed centrally—through the Diamond Trading Co. in the case of gem diamonds, and through Industrial Distributors (Sales) Ltd. in the case of industrial diamonds.

Total sales of diamonds last year reached the record figure of £50,967,041, of which gem diamonds accounted for £38,357,698 and industrial diamonds £12,609,343. A review of the Diamond Industry in 1950 begins on page 43.

## COPPER—COAL—INDUSTRIALS

The corporation is also closely identified with the mines of the Northern Rhodesian Copper Belt, in this case through its control of Rhodesian Anglo American, which in turn controls the Rhokana Corporation, an article about which appears on page 179. The corporation also has substantial shareholdings in Nchanga Consolidated Copper Mines and Mufulira Copper Mines.

In the post-war period, when the demand for coal throughout Southern Africa has been rapidly expanding, Anglo American has itself been considerably extending its colliery interests. These are held through the medium of associated companies which together contribute over 40 per cent of the Union's coal production. The corporation's coal interests are discussed at greater length in an article dealing with the African & European Investment Co. on page 153.

The corporation's investments are not confined to mining, but extend to over a dozen industrial and real estate undertakings although these represent but a small proportion of its total capital. Among these is the First Electric Corporation of South Africa, which is closely associated with Associated Electrical Industries Ltd., of Great Britain. Another venture with which the corporation is associated is that of African Cables, Ltd., while in the engineering field it has collaborated with Murex, Ltd., in forming Hard Metals, Ltd., which undertaking is manufacturing tungsten carbide bits for rock drills.

The advantage of the very wide spread of the corporation's interests was illustrated in the difficult years prior to devaluation, when the relatively small profits being earned from gold mining were offset by the prosperity of diamond and copper mining. At the present time, of course, it would be difficult to find three commodities holding out a better prospect of steady profits, or providing a better investment hedge against inflation and threats of war.

The corporation made a net profit for 1950, after taxation, amounting to £2,340,000 compared with £2,886,000 in the previous year. The latter figure, however, included approximately £1,000,000 arising from the sale of the corporation's holding in Springbok Colliery. A sum of £3,050,000, representing share premium less expenses of new issues, has been placed to the general reserve account, which now stands at £12,650,000. Last year the corporation altered its policy of paying only one dividend yearly by declaring an interim of 2s. (20 per cent) on its Ordinary shares for 1950 followed by a final dividend for the year of 2s. per share, together with a repetition of the 2s. bonus distribution, bringing the total distribution to 60 per cent—the same as for 1949.

A problem which has been engaging the attention of the corporation during the past year, in common it may be said with other South African finance houses, has been that of providing the necessary additional capital which will be required to bring the mines of the Orange Free State to maturity. In this connection an interesting event was the negotiation last summer of an agreement with the Union Bank of Switzerland, whereby the Bank granted a loan of approximately £4,000,000 to carry interest at four per cent, and to be repayable at par in 1962.

Last year the corporation also gave its own shareholders the opportunity of participating in the raising of new capital by offering 567,227 new 10s. Ordinary shares to shareholders at £6 10s. each in the proportion of one for every ten held. This operation realized further new capital to the amount of £3,594,800. The issue of these new shares increased the issued capital of the corporation to £5,499,127 10s. in 6,239,505 10s. Ordinary shares and £2,379,375 six per cent cumulative preferred stock.

## ANGLO AMERICAN'S RAND INTERESTS

The Anglo American has under its aegis some of the most successful gold mining properties on the Far Eastern section of the Rand, including Brakpan Mines, Springs Mines, Daggafontein, East Daggafontein and South African Land and Exploration. In the Klerksdorp districts the corporation controls Western Reef's Exploration & Development and Vaal Reefs Exploration & Mining, and has played a leading part in exploring the ultra-deep levels of the Western Rand. In this connection the corporation took the initiative in forming Western Ultra Deep Levels to explore properties south of the West Wits line and to test the deep level boundaries of Blyvoor and West Driefontein. The success which has attended these drilling operations has encouraged the hope that mining science and technique may overcome deep-level problems and perhaps make mining at 10,000 ft. a practical proposition.

The table on the opposite page gives a summary of the operating results for the Corporation's Rand producers during the past year—the first full year with gold at the post devaluation price of 248s. Comparative figures for 1949 are also shown.

## BRAKPAN MINES

Like other old-established producers of the Far Eastern Rand, Brakpan has virtually completed the development of the area on which work was originally commenced. The company is now engaged on the remaining parts of the Witpoort area but results have shown percentage payability to be low. Devaluation has helped to raise this and hope now centres on the footwall reefs which underlie the Main Reef Leader.

The company continues to hold 361,067 South African Land shares and the dividend received from this source was again higher at £56,967.

Of the 69,521 ft. of development work accomplished, 54,940 ft. were sampled, payability being 25.9 per cent.

Payable ore reserves at the end of 1950 were estimated at 3,825,200 tons of 4.58 dwt.

## SPRINGS MINES

The property of Springs Mines, which lies to the south-east of Brakpan, went through a difficult time just after the war, but since the West Springs property became amalgamated with it in 1948 costs have been reduced, its prospects have much improved and last year it paid a dividend of 22½ per cent compared with nil in 1947 and 1948.

The mine is developing both the Main and the Kimberley Reefs and of the 22,935 ft. sampled on the former last year, 35.9 per cent proved payable while of the 10,565 ft. of Kimberley Reef sampled, 21.3 per cent proved payable.

A small increase in ore reserves was recorded, which now amount to 4,042,500 tons, of a value of 4.32 dwt.

## SOUTH AFRICAN LAND & EXPLORATION

The position of this company's property, situated between Springs Mines and Brakpan gave hope, to begin with, that here was another outstanding mine. Although the good results of the early years (milling began in 1938) have not been fully maintained—dividends having dropped from 200 per cent in 1940 to

39 per cent in 1947—yet more recently devaluation coupled with better payability, has much improved the mine's prospects.

In the middle of last year normal hoisting through the mine's sub-vertical shaft started and this, with the aid of a good labour complement, enabled milling to be stepped up by 192,500 tons to 1,256,000 tons.

Development footage was more at 68,772 and of the 48,150 ft. sampled, 46.8 per cent proved payable of 14.73 dwt. An increase of 276,000 tons was shown in the ore reserves at 3,022,200 tons, value 4.61 dwt.

## DAGGAFONTEIN MINES

For some years past Daggafontein Mines has been amongst the most consistent of the Kaffir producers. In the earlier years of its career the mine progressed rapidly with its primary development, which was made possible by the advance of drives from the adjoining Springs Mines, situated on its Western boundary.

It has established a very strong ore reserve position mainly from the Main Reef Leader, although the Kimberley Reef has also given excellent results and considerably extended the life of the mine. The footage of development in 1950 on the Main Reef Leader was 21,448 against 18,884 ft. and the payability of the 15,910 ft. sampled was 42.2 per cent, averaging 12.28 dwt. On the Kimberley Reef the footage was 33,111 ft. and of the 23,970 ft. sampled, 46 per cent proved payable of a value of 12 dwt. Ore reserves stand at 14,608,400 tons, value 5.78 dwt., including about 4,500,000 tons from the Kimberley Reef.

## EAST DAGGAFONTEIN MINES

The property of East Daggafontein is situated immediately east of Daggafontein and a great deal of initial expenses was saved by the fact that the use was obtained of this latter company's No. 1 shaft situated conveniently near the common boundary.

Since production started in 1939 the mill has dealt with 11,970,500 tons of ore for a working profit of £10,431,979 and dividends paid have amounted to £5,443,468, equivalent to nearly 30 per cent per annum on the issued capital of £1,865,000.

Two reefs are being developed in the mine—the Main Reef Leader and the Kimberley. Work on this latter last year gave encouraging results and of the 27,039 ft. of development done, 7,735 ft. or 33.7 per cent of the footage sampled proved payable, averaging 46.26 dwt. over 8.64 in., or 400 in.-dwt. The pay ratio the previous year was only 19.7 per cent. On the Main Reef Leader last year 34,646 ft. were driven, of which 8,325 ft. or 31.8 per cent were payable, averaging 28.16 dwt. over 8.56 in., or 241 in.-dwt.

As a result of the lowering of the pay limit, a further 243,000 tons of ore were brought into the ore reserves, which at the end of 1950 amounted to 4,690,600 tons, value 4.59 dwt. In this tonnage there are 1,248,000 tons of Kimberley Reef series averaging 5.67 dwt.

## WESTERN REEFS EXPLORATION AND DEVELOPMENT

The mining lease of 8,493 claims belonging to Western Reefs is situated in the Klerksdorp district. The effect of war-time restrictions were felt by the company in its underground work, but a great deal of progress has since been made. The mill started up during hostilities in 1941 with a monthly plant capacity of 100,000 tons. The capacity of the two shafts was designed for an output of 200,000 tons per month but this larger tonnage has not been achieved and this failure made unavoidable by the war, has weighed heavily on the company as taxation liability greatly increased after 1945, when the statutory period allowed for amortization of pre-production capital expenditure had expired.

In connection with the company's present programme to exploit the Vaal Reef, which lies below the Elsburg reefs already being worked, a new shaft is being sunk—No. 3 Vertical—sited on the common boundary with the Vaal reefs which is sharing in the expense. At the end of 1950 it had reached a depth of 2,925 ft. and is timed to be completed with the two permanent hoists before the end of this year. A sub-vertical shaft is also being sunk and this has reached a depth of 654 ft.

Capital expenditure during 1950 amounted to £591,558, incurred mostly on No. 3 shaft and plant extension, and a further £800,000 is estimated to be required during the current year. The extensions to the treatment plant should be completed this year.

Mine development amounted to 82,318 ft. and of the 16,845 ft. sampled, payability was 48.8 per cent. Ore reserves stand at 4,173,000 tons of 5.23 dwt.

## VAAL REEFS

The area of ground owned by the Vaal Reefs Exploration and Mining is in the Klerksdorp district adjoining the property of Western Reefs, the company being an off-shoot of this latter. Some 15 boreholes have been put down to delimit the Vaal Reef and results have provided reasonable grounds for the belief that the area is underlain by the Vaal Reef in payable quantities. A prospecting and mining lease has been granted.

Meantime, shaft sinking is in progress. The No. 3 vertical shaft is being sunk by Western Reefs, of which Vaal Reefs has undertaken to bear one-third of the cost of sinking, equipping and maintaining; the balance being paid by Western Reefs. The ratio of payment between the two companies is proportional to the use and facilities anticipated to be made available. It has been sited to open up and develop the mines economically and expeditiously, and completion is expected by the end of the current year. The foundations of the two permanent hoists have been finished and their erection and commission is anticipated by the end of this year.

A sub-vertical shaft is also being sunk and has attained a depth of 654 ft. below the collar of the underground hoist chamber. It is being equipped with three hoists and it is expected that development will commence from the shafts during the latter part of next year.

## ANGLO AMERICAN'S O.F.S. INTERESTS

Nothing approaching justice could be done in this short space to the initiative and enterprise shown by the Anglo American Corporation in opening up the new O.F.S. goldfield. Leadership in this great task has rested indisputably with the corporation and its far-sighted chairman, Sir Ernest Oppenheimer. The corporation's principal instrument in the creation and financing of its O.F.S. mines has been the Orange Free State Investment Trust Ltd., colloquially known as "Ofsits." This undertaking is directly or indirectly interested in almost every mining enterprise in the Free State, and the returns from them will enable "Ofsits" to make substantial rewards to its shareholders. Hence from this source alone high hopes are entertained.

Anglo American controls seven out of the thirteen developing mines in the field. They are Free State Geduld, Welkom, President Steyn, President Brand, Western Holdings, Loraine Gold Mines and Jeannette Gold Mines. These are all making good headway and promise to become high-yielding gold producers. In addition to the attention given to its own properties, Anglo American recently subscribed in cash for 500,000 shares in "Geoffries."

The corporation is also developing two townships—Allanridge and Welkom. This latter is the geographical centre of the Orange Free State goldfield and, with as many as six large gold mines in its immediate vicinity, it promises to become the most important residential, commercial and industrial city in the Orange Free State.

Although borehole prospecting is still being actively carried out in several areas of the O.F.S. outside of the group of

## OPERATING RESULTS FOR CORPORATION'S RAND PRODUCING MINES

| Company | Year Ending | Tons Milled (000) | Yield per ton dwt. | Revenue per ton s. d. | Costs per ton s. d. | Profit per ton s. d. | Total Working Profit £ | Sundry Revenue Net £ | Government Taxation and Lease Payments £ | Capital Expenditure and Other Appropriations £ | Net Profit £ | Dividends Per Share s. d. | Dividends Amount £ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brakpan | 1949 | 1,301 | 3.9 | 39 2 | 32 0 | 7 2 | 463,963 | — | 169,063 | 73,446 | 221,454 | 1 0½ | 244,375 |
| | 1950 | 1,401 | 3.8 | 47 8 | 34 2 | 13 6 | 948,026 | 70,867 | 441,112 | 67,310 | 510,471 | 2 1½ | 488,750 |
| Springs | 1949 | 1,959 | 2.9 | 29 2 | 25 3 | 3 11 | 383,099 | — | 8,421 | 340,588 | 34,090 | 0 6 | 252,750 |
| | 1950 | 2,125 | 2.6 | 33 2 | 26 2 | 7 0 | 745,260 | 9,902 | 67,031 | 40,438 | 647,693 | 1 1½ | 568,688 |
| S.A. Land | 1949 | 1,063 | 3.5 | 34 8 | 27 4 | 7 4 | 391,904 | — | 77,700 | 54,108 | 260,096 | 1 6 | 185,625 |
| | 1950 | 1,256 | 3.5 | 44 2 | 30 1 | 14 1 | 886,092 | 4,982 | 367,577 | 126,587 | 396,910 | 3 0 | 371,250 |
| Daggafontein | 1949 | 2,579 | 5.1 | 51 0 | 20 7 | 30 4 | 3,915,088 | — | 2,070,811 | 288,878 | 1,555,599 | 4 4½ | 1,531,250 |
| | 1950 | 2,904 | 5.0 | 63 8 | 21 9 | 41 11 | 6,087,388 | 107,037 | 3,580,530 | 341,899 | 2,271,996 | 6 6 | 2,275,000 |
| East Daggafontein | 1949 | 1,140 | 4.2 | 42 2 | 26 3 | 15 10 | 903,055 | — | 409,602 | 85,832 | 407,621 | 2 3 | 419,625 |
| | 1950 | 1,189 | 3.9 | 49 9 | 27 8 | 22 1 | 1,313,861 | 3,859 | 652,613 | 13,905 | 651,202 | 3 6 | 652,750 |
| Western Reefs | 1949 | 1,021 | 4.9 | 48 9 | 29 10 | 18 11 | 968,302 | 145,087 | 401,236 | 62,206 | 649,927 | 1 4½ | 472,656 |
| | 1950 | 1,114 | 4.7 | 59 10 | 31 11 | 27 11 | 1,558,044 | 22,709 | 690,011 | 24,867 | 865,875 | 2 6 | 859,375 |

developing mines, it is on these latter that chief attention centres at this moment when the most advanced are nearing the production stage.

## WELKOM GOLD MINING

This is the first of the group which is being brought to the production stage. It comprises a big area and occupies an important position as the central mine of a compact block. It is the parent of both the President Steyn and President Brand and has a large shareholding in the companies formed to open up those mines.

Work on the property goes ahead well. Two shafts are being carried down to a depth of approximately 3,050 ft. below the collar and they have been equipped with shaft boxes and bins to allow for hoisting from the 2,900 ft. level. No. 2 shaft is equipped, while development, which started last September, has gone forward on four levels.

Priority is being given to the haulage between the shafts as when this is completed—probably about August—it will be possible to utilize a larger labour force underground, and milling can commence. The mill has a rated capacity of 50,000 tons a month, and its actual erection was completed during the first quarter of the current year.

That the mine has been able to reach the development stage so soon is in great measure attributable to the company's good fortune in being able to purchase the redundant plant resulting from the Springs-West-Springs merger some two years ago.

After production has started, the No. 2 shaft will stop hoisting and permanent steel headgear will be erected and the shaft sunk to its final depth of about 5,200 ft., while the No. 1 shaft will continue hoisting rock for the mill. Thereafter, No. 1 shaft will be closed and the process reversed.

The prospects for the mines of the O.F.S. as a whole are discussed at greater length in a separate article from our South African correspondent on page 135.

## PRESIDENT STEYN

Since the President Steyn was launched in January, 1948, a great deal of work has been done on the property. Two shafts are being sunk; the No. 1 having attained a depth of 3,007 ft., and No. 2, 3,035 ft. The Basal Reef is expected around 4,000 ft. in the No. 1 shaft.

Drilling has also been proceeding and earlier this year borehole WP6, on farm Witpan, situated practically in the centre of the property about three-quarters mile north-west of No. 2 shaft, intersected the Leader Reef at 3,862 ft., averaging 1.61 dwt. A payable result was not expected since the reef in this region has shown poor results, but the Basal Reef, which was 70 ft. lower down at 3,932 ft., assaying 15.15 dwt. over a true width of 35.2 in. equal to 546 in.-dwt. Converting this to dwt. per ton, which is, after all, the crucial figure, the result is 11 dwt. Bearing in mind that profitable mining operations are being carried out on the Rand on an average of about 3.8 dwt., this value for President Steyn promises well.

Drilling had indicated that large blocks of payable reef will be available above 4,200 ft. It is the intention to stop No. 1 shaft temporarily below the Basal Reef horizon and start on the haulage to connect the two shafts. Ore reserves can then be built up and crushing start earlier than would otherwise be possible.

As a result of a rather ingenious capital issue scheme introduced last year the company now has ample funds. 2,500,000 new 5s. shares were offered to shareholders at 20s., in the proportion of one for every two held. Each share carries an option to take up £1 of registered unsecured convertible notes between February 1, 1952 and April 30, 1952. The notes carry interest at five per cent from May 1, 1952 and will be convertible into Ordinary shares at any time up to October 1, 1953, on a one for one basis. Unsecured notes can be repaid or redeemed on the specified dates.

## PRESIDENT BRAND

The third operating mine in the Welkom trio, President Brand, was floated in 1949 and work on the property is less advanced than on either of the others. The mining lease area of 4,262 claims lies immediately east of the St. Helena property and the common boundary has been adjusted by a mutual exchange of claims.

The Basal Reef was intersected in nine out of ten boreholes and values ranged from 28.1 to 889.9 in.-dwt. and the depth from 4,122 to 6,079 ft.

Two shafts are being sunk: the No. 1 has attained a depth of 2,213 ft., and No. 2, 1,529 ft. The Basal Reef is expected to be met with in No. 1 shaft at 4,600 ft. In No. 2 shaft, however, it lies at a depth in excess of 6,000 ft. The shaft will, therefore, be stopped at 5,700 ft. and a crosscut made to the reef at this higher level.

A great deal of surface work has been done and a substantial number of mine buildings, stores, compressor houses, etc. completed and brought into use. Permanent headgears have been erected and winders and sinking hoists are in operation.

The shaft sinking methods are similar to those employed at the other mines of the group except that the partial concrete linings are in vertical strips instead of horizontal rings round the shafts.

With the progress of work, additional funds will be required and careful consideration is being given to this matter. The company started with a share issue of £1,250,000 and an unsecured loan from Welkom Gold of a similar amount. It holds in reserve 3,000,000 5s. stock units.

## WESTERN HOLDINGS

Western Holdings, which was the first of the Anglo American's O.F.S. companies to be formed, was registered in 1937 and acquired options over various farms in the Ventersburg, Hoopstad, Kroonstad and Bothaville districts. The property, which the company is itself mining, is in the Ventersburg district between Free State Geduld and St. Helena.

Two shafts are being sunk to a final depth of 5,200 ft., but they will be temporarily stopped below the Basal Reef horizon in order that development may proceed and sufficient ore opened up to allow the mine to go into production in mid-1952. No. 1 shaft will develop towards Free State Geduld No. 2 shaft to effect a junction with that company's development. Every endeavour will be made to carry out some development of the area in the neighbourhood of borehole No. 1, on farm Geduld No. 197. Work is well advanced on the reduction plant.

In addition to its direct mining interest, Western Holdings has a portfolio of investments with a book value of £292,782 together with debentures valued at £361,625. The company also has options over five farms south of the Vaal River where drilling has indicated good values.

The company is largely interested in the Welkom group by reason of the vendor consideration and subscription rights received when it transferred a large area of ground some years ago. The company will also receive vendor consideration and subscription rights in consideration for the inclusion of My Betty and Goudrand in the lease area of Jeannette Gold Mines.

## FREE STATE GEDULD

It is generally conceded that the mining area belonging to Free State Geduld Mines has probably the greatest potentialities of any in the O.F.S. in consequence of the phenomenal values returned from the preliminary drilling programme. Two shafts are being sunk and a scheme of development was outlined some time ago, which, however, has since been modified. Recent drilling has provided further technical information as the result of which the consulting engineers have advised that the No. 2 shaft should be sunk to its final depth of 5,600 ft. This will delay the start of development for some months but it is anticipated that when the development programme is initiated, the building up of ore reserves will be more rapid.

At the end of March last the No. 1 shaft had reached a depth of 3,208 ft., which is about 1,500 ft. above the Basal Reef horizon. The No. 2 shaft was then down to 3,805 ft.

For the purpose of obtaining data for development planning, two boreholes were sunk last year. Results announced in February last of the one on farm Mijannie No. 166, which has a common boundary with Western Holdings, gave fresh indication of the gold content of the Basal Reef on the southern portion of the property. It was penetrated at a depth of 4,829 ft. assaying 349.4 dwt. over 50 in., equivalent to 1,747 in.-dwt.

## LORAINE AND JEANNETTE

The Loraine and Jeannette Gold Mines are in their early stages. They have come into being as a result of the separation of what was known as the Wit Extensions block on which a prolonged drilling campaign was carried out, and the results obtained indicated that the Basal Reef horizon underlay the area except where interrupted by faulting.

Loraine Gold Mines was formed to take over about one-half (the western portion) of the block. In addition, it will acquire the mineral rights of the farms covered by the lease and certain farms adjoining the northern and north-western boundaries of the lease together with an option to purchase the mineral rights of a farm lying immediately north of the lease area.

The authorized capital of the company is £5,500,000 in shares of 10s. each and the initial issued capital, £3,000,000. Both Wit Extensions and Ofsits shareholders have been offered the right to take up shares.

No time has been lost in opening up the mine; shaft sinking operations and ancillary work have been in progress since November of last year, finance having been obtained by a loan from Anglo American Corporation. At the end of March last, No. 1 shaft had reached a depth of 636 ft., and the collar of No. 2 was started.

In the near future the Jeannette Co. will be floated to take over the remaining eastern portion of the Wit Extensions lease area, the capitalization and participations of which will be similar to those of Loraine.

Loraine and Jeannette will be served by the new township of Allanridge, which is located in the north-east corner of the Loraine property near the corner boundary with Jeannette. Like Welkom, this township is being developed by the corporation on model lines.

# African & European Investment Co. Ltd.

WITH a career extending over nearly fifty years, the African & European Investment Co. has progressively expanded its scope and interests. Managed by the Anglo American Corporation, this company has financed and developed gold and coal properties, and almost since its inception has been interested in farming and real estate. It was one of the early venturers into the Orange Free State, taking options over large areas of ground with mineral rights and vendor interests. Some of these it has ceded to other participants and has thus become a shareholder in new O.F.S. enterprises.

It held the mineral rights over the large area known as Block 7 in the Free State and after a drilling programme had successfully disclosed its potential value, the Welkom Gold Mining Co. was formed and African & European thus became associated as vendor with the group, which now includes President Brand and President Steyn. The company still has a large participation in the remaining northern, central and eastern portions of Block 7; but has relinquished its interest in options on the Block 8 area to the north-east. The future of much of its ground still depends upon the result of further drilling, but it is quite within the bounds of possibility that there will be added to the growing number of Free State gold mines yet other potential producers.

The need for the company to raise more money to assist in the development of its Orange Free State interests and colliery undertakings took concrete shape last year when it was announced that a convertible loan of £1,700,000 was to be be made to the company by the Anglo American Corporation of South Africa. It was agreed that a further £495,000 would be provided, as and when required, by the Corporation subscribing at 11s. a share for the whole of African & European's 900,000 unissued 6 per cent Cumulative Preference shares at any time during the period between December 1, 1950 and December 31, 1951.

The terms governing the loan provide for the issue of 4½ per cent Registered Unsecured Notes of £100 each, convertible during the period April 1, 1953 to March 31, 1955, at the option of the Anglo American Corporation into 510,000 African & European Ordinary shares at the rate of 30 for each £100 note; equal to 66s. 8d. per African & European share. In the event of non-conversion, the loan will remain outstanding until March 31, 1962, but the company will have the right to repay the loan on or after April 1, 1957 in multiples of £100,000, at any one time, provided 30 days' notice is given.

The company's accounts for 1950 show that total revenue amounted to £714,482, which compared with £920,731 previously, and included income from the sale of farms, mineral interests, etc. Of the total revenue, rentals, royalty, etc., brought in £82,771; profits from share dealings amounted to £319,017 and dividends received £262,173. With administration expenses at £45,862, the net profit amounted to £668,620 against £874,559 the previous year. Taxation absorbed £70,000. A sum of £400,000 was allocated to general reserve and £130,000 to depreciation of shareholdings. Apart from real estate and mineral rights, etc., which had a book value of £348,517, the principal assets of the company are its investments, amounting in total to £4,627,992. Quoted investments appear in the balance sheet at £4,011,540, the market value at December 31, 1950, being £10,756,252. The Ordinary dividend was 2s. 6d. per 10s. stock unit compared with 2s. in the previous year.

Among its investments the more recent acquisitions have been shares in Harmony Gold Mining and Loraine Gold Mines. The remainder include shareholdings in Amalgamated Collieries of South Africa; Coronation Collieries; Grootvlei; O.F.S. Land & Estate; St. Helena Gold; United Steel of South Africa; Vereeniging Estates; Welkom Gold; Western Holdings; Western Ultra Deep Levels, etc.

## LYDENBURG ESTATES LTD.

The company still retains its substantial interest in Lydenburg Estates—a London registered company formed in 1938—which was one of the early undertakings to acquire options and mineral rights in the O.F.S. With the passage of time these have increased in value, and the company is now in possession of a portfolio of shares in leading mining companies which it has acquired, for the most part, from its vendor and participating interests. Amongst its principal holdings are Welkom Gold Mining, President Steyn, President Brand and Virginia Gold. The last balance sheet for the year ending June 30, 1950, showed quoted investments at £212,286, with a market value of £483,160.

Although Lydenburg Estates has recently abandoned its interest in the Block 8 area in the Orange Free State, it has retained interests in farms and mineral rights in the Northern, Central and Eastern areas of the remainder of Block 7. A drilling programme is in progress in the Eastern area, and the Basal Reef has been intersected.

In the Sand River area the company's main interest has been in farms comprising the Witkin Block, most of which have been ceded to the Merriespruit Gold Mining Co. The subscription rights arising from this cession enabled Lydenburg Estates to offer its stockholders five Merriespruit shares at par for every twelve stock units held.

A small part of the Witkin Block situated in the Harmony Lease area was exchanged for an area of similar size in the Virginia Gold Mining Co.'s lease area, with the result that the company no longer has an interest in the Harmony Gold Mining Co., but has exercised its right to subscribe for shares and debentures in the Virginia Gold Mining Co.

## FREE STATE SHARE PORTFOLIO

Either directly through vendor share participations such as those mentioned above, or by way of purchase, African & European has acquired a portfolio of shares in the leading potential gold producers of the O.F.S. St. Helena and Welkom Gold, in both of which it has substantial interests, promise to be the first producers of gold, with milling due to start during the present year. The company's holding in Ofsits, which has large and varied share interests, multiplies African & European's indirect interest in a great number of companies. Its shares in President Brand and President Steyn provide it with direct participation in two developing mines which have given evidence of having a big future. Schemes for financing them have been evolved and work on each of the properties has gone well, encouraged by the stimulus of good borehole results.

## COLLIERY INTERESTS

The prescience which was shown in the early days by the African & European in acquiring interests in South African coal, has been well rewarded. Through the medium of its associated company, the Vereeniging Estates, Ltd., it holds a large stake in the industry. The producing collieries under its administration include: Amalgamated Collieries of South Africa Ltd.; S.A. Coal Estates (Witbank), Ltd.; Springbok Colliery Ltd.; The Coronation Collieries Ltd.; and Vryheid Coronation Ltd. They produced a record of 11,900,000 tons of coal during 1950, which was approximately 40 per cent of the total Union production.

The profit of Vereeniging Estates for 1950 amounted to £637,490 and the company paid a dividend of 25 per cent.

Amalgamated Collieries of S.A. Ltd. is proceeding with its large expansion programme which was estimated to cost £2,500,000. Initial funds were provided by a new capital issue while part of the profits are also being allocated to meet further needs. Another source of capital exists in the arrangement come to with the African & European for loan facilities up to an amount of £900,000. In consideration of this latter an option has been given to the company over 330,000 of the reserve shares of Amalgamated Collieries at 55s. per share exercisable between January 1, 1953, and March 31, 1953.

Vryheid Coronation is also making good headway with the modernization of its coking plant and is replacing the open burning ovens with a much later type of waste heat retort. This is to cost about £1,500,000 and here again funds will be obtained in the same way as for Amalgamated Collieries of S.A. African & European has agreed to provide necessary money up to £500,000 and in return has the option to subscribe for 765,688 shares of the reserve capital of Vryheid Coronation Ltd. at 12s. 6d. per share.

Not only do the company's collieries supply home industries but there has been a growing export market to the Rhodesias and elsewhere.

## NEW COAL INTERESTS

Following its newly-acquired participation in the Newcastle-Platberg Colliery Ltd., which is establishing a new colliery in Natal, African & European has further expanded its coal interests. It has become largely interested in the New Monteleo Co., the subsidiaries of which have considerable potential value and has formed jointly with the New Monteleo Co., the Natal Coal Exploration Co. which is to develop a new colliery in the Newcastle District, where, as a result of drilling, a field estimated to contain 29,000,000 tons of coal has been discovered.

The company has acquired a substantial stake in the Natal Anthracite Colliery, which should reach an annual production rate of 300,000 tons this year.

# The Central Mining & Investment Corp. Ltd.

THE Central Mining & Investment Corporation, Ltd., is associated with Rand Mines, Ltd. in the technical and administrative control in South Africa of 12 producing gold mines situated in the Transvaal, and also certain important land, coal and industrial undertakings.

The technical administration of these companies is provided by the Central Mining through consulting mining engineers, electrical and mechanical engineers and metallurgists, while secretarial, transfer and other ancillary services are performed by Rand Mines.

In addition to their shareholdings in the "group" companies, both the Central Mining and Rand Mines have a considerable interest in other gold mining and industrial companies in South Africa, and in the exploration and development of the Orange Free State goldfield.

Outside South Africa the major interest of the Central Mining is in the oil industry. The corporation has been associated with the long and successful operation of Trinidad Leaseholds, Ltd., since the formation of that company in 1913, and has an interest in a marine concession for oil over an area of the continental shelf in the Persian Gulf.

In May, 1950, the 425,000 Ordinary shares of £8 each of the corporation were split into shares of £1 each, and subsequently, the capital was increased by the issue of 600,000 Ordinary shares of £1 each at £2 per share, which were offered for subscription by the Ordinary and Preference shareholders in the proportion of 1 new for every 8 held. The issued capital at that time was £4,400,000 in £1 shares (of which 1,000,000 were Preference shares) and thus 550,000 shares were set aside to meet shareholders subscription rights. Applications were invited from shareholders for the balance of 50,000 shares and for such shares as were not required to meet the subscription rights of other shareholders. The issue was oversubscribed; after applications for rights had been satisfied the "excess" shares available for subscription amounted to 79,687 against which applications for 182,904 shares were received.

The corporation's issued capital is now, accordingly: £5,000,000 divided into 4,000,000 Ordinary shares of £1 each, and 1,000,000 five per cent cumulative Preference shares of £1 each.

The gold mining industry continued during 1950 to sell a proportion of its output at enhanced prices for artistic and industrial purposes. The additional revenue derived from this source amounted to about £2,100,000 as compared with about £1,100,000 in the preceding year.

In the table that appears later in this article this additional revenue has been included in the working profit figures.

The past year was noteworthy for the considerable progress that has been made towards bringing closer to production the gold mining properties that are being opened up in the Orange Free State goldfield, by the various South African mining finance houses. In this connection the Central Mining and the Rand Mines were responsible for the formation of the Harmony Gold Mining Co., Ltd., in August, 1950. This company has been granted a mining lease by the Union Government to carry on gold mining operations on the "Harmony Block" of farms situated in the Ventersburg district of the Orange Free State. The lease area is approximately 5,523 claims and drilling results indicate that payable Basal Reef at a workable depth underlies a large portion of this area. It is proposed to sink three shafts to open up and develop the property. The sinking of two of these commenced in August, 1950; both are circular shafts with a diameter of 24 ft. The more easterly of the shafts, to be known as the ventilation shaft, is expected to intersect the Basal Reef at a depth of about 4,200 ft., while in the second shaft, to be known as No. 3 shaft, the reef should be intersected at a depth of about 4,800 ft. At December 31, 1950, the depths to which the ventilation and No. 3 shafts had been sunk were 813 ft. by 832 ft., respectively. Development will be done from both shafts, and as they are only 4,300 ft. apart, it should be possible to connect them underground in a relatively short time. The development programme envisages the commencement of a third shaft, to be known as No. 2 shaft, before initial production. This will be situated to the west of No. 3 shaft. It is estimated that with intensive development, and assuming that faulting in the area is not abnormally severe, sufficient payable ore will be made available for the commencement of milling at a rate of 40,000 tons per month during 1955, with good prospects of raising the capacity of the mine to 80,000 tons per month during the following year and of ultimately increasing the capacity to 160,000 tons per month.

The authorized share capital of the company is £3,000,000 divided into 12,000,000 shares of 5s. each, of which 8,000,000 shares have been issued, and are dealt in on both the London and Johannesburg Stock Exchanges.

The "group" has a further interest in the Orange Free State goldfield through the medium of a company entitled Central Mining Free State Areas, Ltd., which was formed in August, 1949, to administer its interests in that field. This company has an authorized share capital of £5,000,000 divided into 20,000,000 shares of 5s. each, of which 12,000,000 shares have been issued and are dealt in on both the London and Johannesburg Stock Exchanges. The company's investments included a controlling interest in Union Free State Coal & Gold Mines, Ltd., which owned the major interest in the mineral rights over the Harmony Farm and whose shareholders were offered the right to subscribe for shares in the Harmony company on the basis of three Harmony shares for ten Coal & Gold shares. Thus, in respect of C.M.F.S.A.'s holding of 2,510,750 Coal & Gold shares it was entitled to subscribe for 753,225 shares in the Harmony company which are retained in its portfolio. C.M.F.S.A. has, in addition, interests in the Orange Free State comprising mineral rights and option and prospecting contracts over considerable areas of ground, and is participating in the drilling operations of several boreholes with a view towards obtaining a better understanding of the geological formation and the structure in and around the areas over which it holds options.

## BLYVOORUITZICHT GOLD MINING CO., LTD.

The table on the opposite page compares the company's operating results over the past 2½ years. The extension of the reduction plant from a capacity of 80,000 tons to 120,000 tons per month was completed after the close of the company's financial year since when it will be seen there has been a gradual increase in the tonnage milled. Until the ten-ton winder is in commission at No. 2 shaft it will not be possible to improve the tonnage treated very materially. It is hoped that it will be in operation early in 1951 but the rate at which the output can thereafter be expanded will depend primarily on the extent to which the underground labour force can be increased beyond the present inadequate strength and on the extent to which the Electricity Supply Commission can meet increases in the mine's power requirements.

It is estimated that capital expenditure during the current financial year (to June 30, 1951) will amount to approximately £1,100,000 as compared with £701,734 in 1950 and £1,245,623 in 1949. This year's expenditure will be incurred principally on increasing the hoisting capacity, additional pumping equipment and a compressor at No. 2 shaft, winders and power supply for the incline shafts, extensions to the reduction plant, a recreation hall and housing for European and native employees. The balance of working capital on hand at June 30, 1950, was £2,267,938.

A feature of the development results has been the continued high payability of the footage sampled on reef. During the past 2½ years the footage on reef has averaged about 45 per cent of the total development footage, and payability has averaged higher than 97.5 per cent with a value of well over 500 in.-dwt.

By arrangement with the Atomic Energy Board of South Africa the company is in process of erecting a plant for the extraction of uranium from residue slimes. It is expected that the plant will be in operation sometime in 1954, the cost of which will be financed by the Atomic Energy Board. It is estimated on the basis of present costs and after providing for lease consideration and taxation that the net profits accruing to the company during the ten-year period, for which a sale contract has been arranged, will be of the order of 2d. per share per annum on the existing capital of the company.

## CONSOLIDATED MAIN REEF MINES & ESTATE, LTD.

The results of operations for the past 2½ years are set out in the table opposite. Since the close of the company's financial year (June 30, 1950) there was a breakdown for five weeks of the rock hoist at No. 3 shaft, which was the principal shaft for the higher grade ore mined from the Main Reef and Main Reef Leader in the deeper levels of the eastern portion of the mine.

Whilst it had been possible to maintain milling at a satisfactory level by drawing on surface reef dumps, the grade of ore milled had been seriously affected.

The serious depletion of ore reserves during the past ten years had been halted as a result of devaluation in September, 1949. During the last financial year the available reserve had been increased by 287,000 tons—the first normal increase since 1939.

## EAST RAND PROPRIETARY MINES, LTD.

The table below on this page compares the results for the past two years. During the year the capital of the company was increased by the issue of 360,000 shares at 62s. 6d. per share, which were offered for subscription by shareholders in the proportion of one new share for every ten shares held. The issue which was underwritten by the Central Mining was subscribed for to the extent of 83 per cent. The new shares ranked for the December, 1950 dividend, which was maintained at the same rate as for the June, 1950 distribution, viz., 2s. 6d. per share.

The purpose of the new issue was to finance part of the large capital expenditure programme that was in hand. At January 1, 1950, it was estimated that £4,450,000 would be required for this purpose. The proceeds of the new issue provided £1,100,000, leaving £3,350,000 to be appropriated from profits during the five years estimated to be required to complete the programme. Capital expenditure incurred during the calendar year 1950 amounted to approximately £820,000.

## OTHER PRODUCING MINES

Central Mining administers nine other gold producing mines on the Rand, namely: City Deep, Ltd., Crown Mines, Ltd., Durban Roodepoort Deep Ltd., Modderfontein East Ltd., Rose Deep, Ltd., Modderfontein B. Gold Mines, Ltd., New Modderfontein Gold Mining Co., Ltd., Welgedacht Exploration Co., Ltd., Transvaal Gold Mining Estates Ltd. (operates in the Lydenburg district of the Transvaal). The results for recent years of the first five of the above mentioned companies are shown in the table.

## TRANSVAAL CONSOLIDATED LAND & EXPLORATION CO., LTD.

At the end of 1950 this company held full rights over farm property in the Transvaal of 117,293 acres and mineral rights over almost 3,500,000 acres. Some areas were being tributed by third parties for the production of asbestos, chrome and tin. The book value of its investments was £374,892, the estimated market value being appreciably higher. The profit earned for the calendar year 1950 was £230,530 and a dividend of 1s. 9d. was declared which compared with 1s. 6d. per share which had been distributed for each of the previous three years.

With regard to the company's large shareholding in Holfontein (T.C.L.) Gold Mining Co., at an extraordinary meeting of that company in February, 1951, proposals to place it in voluntary liquidation were adopted. Consequent upon the increased price for gold following the devaluation of South African currency in 1949, the prospects of bringing the mine to production as an independent unit were re-examined. In the opinion of the company's technical advisers the total ore reserves that would become available as a result of further development at the mine would be low in value and relatively limited in tonnage. Attempts were made to arrange for the southern section of the property to be taken over by one or other of the neighbouring mines but the area was not of interest to them. Every reasonable possibility of exploiting the mine having been exhausted the board decided that it was in the best interest of the shareholders to place the company in voluntary liquidation.

## COLLIERY INTERESTS

**Raleigh Colliery** (owned and operated by Union Free State Coal & Gold Mines).—This colliery is located about ten miles south of Middleburg, in the Transvaal. Production commenced in December, 1949. Output is necessarily restricted until the washing plant can be completed. It was expected to be in operation early in 1951. Up to December 31, 1950, some £953,000 had been expended on the property.

**Van Dyk's Drift Colliery** (owned and operated by Transvaal Consolidated Land & Exploration Co. Ltd.).—This colliery is located in the Witbank district of the Transvaal. Full-scale operations commenced on November 1, 1948 and during the calendar year 1950, 585,000 tons of coal were despatched, and a profit of £102,000 was earned. Up to December 31, 1950, the total expenditure incurred on this colliery amounted to roughly £790,000 which has been provided by the T.C.L. company. The major items of expenditure having now largely been completed profits should in future make an important contribution to the T.C.L. Co.'s income.

**Witbank Colliery, Ltd.**—During the year ended August 31, 1950, the tonnage of coal despatched by this company amounted to 1,362,000 tons and a net profit of £143,730 was earned. Dividends totalling 20 per cent or 4s. per share were paid for this period on the company's issued capital of £385,000 divided into £1 shares. The shares are quoted on the London Stock Exchange. Consideration is being given to the question of installing a suitable coal preparation plant as the results of boreholes drilled in the undeveloped areas indicate the persistence of bands of inferior coal and thin shale seams in the high grade coal. Shareholders will be notified at the earliest opportunity of the board's proposals regarding the installation and financing of a washing plant. Since the company commenced operations in 1898 it had despatched just over 44,000,000 tons of coal up to December 31, 1950.

## INDUSTRIAL INTERESTS

**The Hume Pipe Co. (South Africa) Ltd.**—During the year to June 30, 1950, in order to finance the programme of reconstruction and enlargement of the company's factories so as to be able to meet the demand for its products, the capital was increased by the issue of 31,250 shares of 10s. each at £5 per share, which were offered to shareholders in the proportion of one new share for every ten shares held. The net profit for the year ended June 30, 1950, was £251,159 and two dividends totalling 80 per cent and a bonus of 15 per cent were declared during the company's financial year on the enlarged issued capital of £171,875 divided into 343,750 10s. shares.

**Pretoria Portland Cement Co., Ltd.**—The net profit for the year ended June 30, 1950, at £532,837, was £79,005 lower than during the preceding year, due mainly to higher costs of production, increased rail charges, and lower dividend distribution from subsidiaries resulting from higher costs also on their production. The construction programme at Slurry covering the modernizing of the raw material section, the mechanization of the quarry and the conversion to power supply by the Electricity Supply Commission has been completed. A considerable portion of the new plant for the Hercules factory has been delivered and it is hoped that this new plant will be operating early in 1952. At the end of June, 1950, the unexpended balance of capital funds on hand was £538,773. Additional funds to complete the expansion programme and to meet the commitment in respect of a subsidiary company to enable it to complete its own programme will be required and ways and means of providing these funds are being considered by the board.

## RESULTS OF SOME OF THE CORPORATION'S PRINCIPAL MINES

| Company | Period | Mill (000 tons) | Yield (dwt./ton) | Cost (shills./ton) | Working Profit (£000) | Tax (£000) | Divs. (shills./share) | Development (feet) | Available ore reserves | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Tons (000) | Value (dwt.) | Width (inches) |
| Blyvooruitzicht Gold Mining Co. Ltd. | Half yr. to 31/12/50 | 517 | 14.54 | 45s. 5d. | 3,601 | 1,811† | 1s. 4d. | 19,708 | * | * | * |
| | Year to 30/6/50 | 926 | 14.78 | 45s. 1d. | 6,168 | 3,001† | 2s. 6d. | 35,741 | 5,960 | 13.1 | 46.2 |
| | Year to 30/6/49 | 637 | 15.45 | 46s. 3d. | 2,785 | 887† | 1s. 6d. | 32,640 | 6,136 | 13.7 | 46.1 |
| City Deep Ltd. | Year to 31/12/50 | 1,962 | 4.27 | 39s. 2d. | 1,455 | 563 | 7s. 0d. | 59,720 | 6,012 | 5.8 | 42.6 |
| | Year to 31/12/49 | 1,827 | 4.57 | 35s. 10d. | 906 | 255 | 4s. 0d. | 57,172 | 5,977 | 5.9 | 42.0 |
| Consolidated Main Reef Mines & Estate Ltd. | Half yr. to 31/12/50 | 1,151 | 26.7 | 27s. 8d. | 360 | 137 | 4s. 0d. | 26,683 | * | * | * |
| | Year to 30/6/50 | 2,396 | 27.5 | 25s. 2d. | 901 | 289 | 8s. 0d. | 62,641 | 6,042 | 3.3 | 54.0 |
| | Year to 30/6/49 | 2,225 | 29.6 | 23s. 8d. | 224 | 3 | 3s. 6d. | 80,303 | 5,755 | 3.4 | 54.4 |
| Crown Mines Ltd. | Year to 31/12/50 | 3,375 | 3.58 | 32s. 9d. | 2,117 | 813 | 12s. 0d. | 109,931 | 9,212 | 4.5 | 47.2 |
| | Year to 31/12/49 | 3,111 | 3.77 | 30s. 5d. | 1,149 | 181 | 6s. 6d. | 95,832 | 9,535 | 4.6 | 47.2 |
| Durban Roodepoort Deep Ltd. | Year to 31/12/50 | 2,132 | 3.46 | 30s. 6d. | 1,410 | 424 | 5s. 9d. | 81,128 | 9,312 | 4.2 | 62.1 |
| | Year to 31/12/49 | 2,026 | 3.68 | 28s. 1d. | 861 | 80 | 3s. 9d. | 82,114 | 8,841 | 4.3 | 60.4 |
| East Rand Proprietary Ltd. | Year to 31/12/50 | 2,653 | 4.03 | 32s. 0d. | 2,503 | 861 | 5s. 0d. | 54,340 | 7,055 | 4.8 | 48.4 |
| | Year to 31/12/49 | 2,647 | 4.37 | 28s. 5d. | 1,957 | 550 | 4s. 3d. | 61,347 | 8,430 | 4.8 | 49.1 |
| Modderfontein East Ltd. | Half yr. to 31/12/50 | 740 | 2.44 | 21s. 2d. | 368 | 186† | 4s. 0d. | 5,506 | * | * | * |
| | Year to 30/6/50 | 1,504 | 2.61 | 19s. 6d. | 857 | 417† | 8s. 0d. | 11,355 | 4,347 | 3.0 | 43.3 |
| | Year to 30/6/49 | 1,427 | 2.75 | 18s. 1d. | 416 | 169† | 5s. 0d. | 8,182 | 4,883 | 3.1 | 42.9 |
| Rose Deep Ltd. | Year to 31/12/50 | 1,017 | 2.71 | 27s. 11d. | 324 | 92 | 7s. 0d. | 44,418 | 2,364 | 3.4 | 57.9 |
| | Year to 31/12/49 | 969 | 2.83 | 25s. 2d. | 129 | — | 2s. 0d. | 40,973 | 2,299 | 3.2 | 60.8 |

†Includes lease payment. *Ore reserves not available at half-yearly period.

# Johannesburg Consolidated Investment Co. Ltd.

THE name of Barnato has been associated with the Witwatersrand from the early days. It was in 1889 that the potential wealth of the then new goldfield first attracted Mr. Barnett I. Barnato who, in the face of aggressive competition, began to acquire those mining propositions which constituted the nucleus of the Johannesburg Consolidated Investment Co. Ltd. (colloquially known as "Johnnies"), a company destined to achieve world wide repute.

"Johnnies" started with the modest capitalization of £175,000 against its present figure of £7,000,000 in £1 shares of which 3,950,000 shares have been issued. In addition, £2,000,000 4½ per cent Unsecured Loan Stock has been issued. The gold producers of the Rand which it brought into being have not only made history in South Africa, but have become renowned throughout the world. To-day they consist of five mines, but the company has in the past had to its credit several others including the Glencairn, New Primrose, Langlaagte Estates, and Van Ryn Deep—all profitable undertakings and good dividend-payers in their time.

It must be admitted that the fullest vigour of the Rand mines now remaining under the company's aegis has passed, but it has in its Orange Free State properties potential gold winners which promise to compensate for the waning Rand producers.

Simultaneously with the development of its gold mining interests, "Johnnies" has acquired a spread of other interests. From the very early days it has participated in the Kimberley diamond field and its holding has expanded with the growth and profitability of that industry. The company was one of the early participants in the rich Rhodesian copper belt, while it ventured into platinum mining in the Transvaal many years ago at a time when the future of this industry was far from assured. The confidence it showed in this has been well rewarded by its present predominant interest in this valuable precious metal.

Other mining interests include coal, chrome, and various base-metals. In this last connection it has recently taken a hand in investigating various British lead and zinc propositions in Derbyshire, Wales and Eire.

Like other mining finance houses, "Johnnies" has not limited its activities to the mining industry and now can claim interests in a number of industrial ventures including a valuable participation in The South African Breweries Ltd.

The company's financial year ends on June 30, and its report and statement of accounts for 1949/50 revealed its achievements in a very satisfactory light. An increase in profits was announced, the total before taxation of £1,381,684 being some £243,000 higher than in the preceding year. Before striking this balance, £125,000 was provided against a loan to a subsidiary company. Provision for taxation was higher at £591,843; an amount of £300,000 was allocated to general reserve against nil and £100,000 to investment reserve compared with £400,000 in 1948/49. The maintained dividend of 17½ per cent (3s. 6d. per share) absorbed £380,188.

The main assets of the company are its investment holdings, which figure in the balance sheet at £9,925,353. The market value of quoted securities at June 30, 1950, was substantially in excess of their book value. The net liquid position was shown to have been substantially improved. Current assets figured at £2,740,207, of which £1,536,720 consisted of cash against current liabilities of £1,439,018. Reserves totalled £7,479,143.

An important step was taken by the company in the autumn of last year towards raising the large sum needed to bring its developing gold areas into production. £2,000,000 of 4½ per cent Sterling Unsecured Loan Stock 1958-62 was created and placed privately. No Stock Exchange quotation has been sought and the stock will be redeemed at £101 per cent at latest on December 31, 1962, while the company retains the option to redeem at £101 per cent at any time on or after June 30, 1958.

The remainder of this article gives some account of the progress of "Johnnies" various subsidiary operating companies in the Rand and the O.F.S.

## EAST CHAMP D'OR GOLD MINING

The record of progress shown by this minor undertaking in the group has fully justified confidence placed in it. East Champ D'Or was one of the last of the Rand mines associated with "Johnnies" to become a public undertaking, about 14 years ago, although it had been working as a private venture for many years.

During 1950 a larger tonnage was dealt with—393,000 tons—than in any year since 1943. Gold produced amounted to 56,553 oz. and the yield 2.878 dwt. per ton. Costs rose to 29s. 1d. per ton as against 26s. 10d. in the previous year but the revenue per ton was higher as was likewise the working profit which amounted to £133,077 (excluding £10,738 received in respect of increased revenue from sales, at higher than standard prices, of gold sold for industrial and artistic purposes) against £110,591. This enabled the dividend to be increased to 9d. per share, which absorbed £77,962, against 8½d. the previous year. Taxation called for more, £52,153, and the unappropriated balance of revenue carried forward was £76,019.

Development work amounted to 8,894 ft. and of the 6,140 ft. sampled, 59.12 per cent proved payable and averaged 9.4 dwt. Some work was done on the Bird Reef but results on this horizon have been disappointing and no more exploratory work is being carried out.

Ore reserves at the end of last year amounted to 486,000 tons of an average value of 3.5 dwt.

## GOVERNMENT GOLD MINING AREAS

Since it started production in 1914, the Government Gold Mining Areas has had an epic career, and its prosperity has well repaid its sponsors for much unrewarded development work which had to be done in the early days. Owing to the gradual exhaustion of the Main Reef Leader the mine has in recent years been dependent for its remaining life on low-grade ore from the upper or hanging wall leaders, the Black Reef, reclamation on the Main Reef Leader and the Kimberley Reef.

The company was able to deal with a larger tonnage of ore last year at 2,859,000 tons but the gold yield was lower at 2.797 dwt. resulting in an output of 399,821 oz. compared with 405,691 oz. Working revenue was consequently higher although costs rose to 28s. 9d. as compared with 25s. 6d. per ton. The working profit increased to £906,398 (excluding £71,577 received in respect of increased revenue from sales, at higher than standard prices, of gold sold for industrial and artistic purposes) compared with £550,723 in 1949. This enabled a bigger distribution to be made and dividends totalled 2s. 4½d., absorbing £665,000, as against 1s. 6¾d. in 1949.

A larger amount of development was carried out last year, the footage being 76,041 and of the 60,920 ft. sampled, 48.81 per cent proved payable averaging 5.2 dwt. Exploratory work on the Kimberley Reef is being continued.

Ore reserves at end-1950 amounted to 8,090,000 tons with an average value of 3 dwt.

## NEW STATE AREAS

For some time now mining operations on New State Areas have been confined to reclamation work and exploration of the older parts of the mine. Production started in 1923 and the property generally has given a good account of itself although its remaining life is now very short. Apart from the splitting of isolated blocks previously deemed to be unpayable as a whole and an insignificant footage on the Kimberley Reef horizon, no development of any consequence remains to be done. Ore reserves have dwindled to 360,000 tons of 3.7 dwt.

The tonnage dealt with last year was 1,019,000—a decrease of 146,000 tons on that of 1949, while 420,050 tons of old residues were treated. The recovery per ton from current ore at 2.239 dwt. was lower than previously and working costs registered a rise of 3s. 2d. per ton to 28s. 7d. The working profit was £82,025 (excluding £23,244 received in respect of increased revenue from sales, at higher than standard prices, of gold for industrial and artistic purposes) as compared with £133,058. The dividend was reduced to 1s. 4½d. per share which absorbed £104,090. Taxation called for £1,206 and the balance unappropriated carried to the balance sheet was £208,412.

## RANDFONTEIN ESTATES

Randfontein is still the largest of the Rand producers milling low-grade ore, and although increased working costs have made an inroad on the benefits derived from the enhanced price for gold, satisfactory profits continue to be made.

The 1950 report gave further interesting information with regard to drilling on the farm Panvlakte 44. A fourth deflection was made in borehole P.V.4. and the Randfontein Leader Reef was intersected at 7,121 ft. assaying 7.4 dwt. over 6 in. During the year a borehole was started on Gemsbokfontein and at the end of December last had reached a depth of 1,992 ft. in the Upper Witwatersrand quartzites.

Information derived from development work and diamond drilling during the year indicated that it was advisable to deepen the North-East shaft and two compartments were sunk to 3,243 ft. Development footage altogether amounted to 117,311 ft. or 29,103 ft. more than in the previous year, and of the 56,365 ft. sampled, 30.14 per cent proved payable averaging 6.4 dwt.

An increase of 123,000 tons of ore were milled at 4,192,000 tons, recovery being 2.339 dwt. Costs increased by 3s. 8d. per ton to 25s. 6d., but revenue was higher and the working profit amounted to £766,006 (excluding £90,024 received in respect of increased revenue from sales, at higher than standard prices, of gold sold for industrial and artistic purposes) compared with £335,526 in 1949. This enabled dividends of 3s. per share to be paid (against 1s.) notwithstanding the fact that taxation, which the previous year was only £7, called for £168,449.

Ore reserves at the end of 1950 amounted to 5,550,000 tons of 2.7 dwt. as against 5,750,000 tons of 2.8 dwt. previously.

## WITWATERSRAND GOLD MINING

This old mine has been producing since 1888 and it speaks well of the management that its operations have continued so long. The higher price for gold has been very helpful and had it not been for this the mine would probably have closed down by now.

Last year's operations resulted in a working profit of £42,679, while an additional £15,191 was received in respect of increased revenue from sales of gold at higher than standard price. The previous year a loss was made, but as a result of last year's profit dividends of 2s. 6d. per share were paid.

A larger tonnage of ore was crushed, 653,000, and although working costs rose by 1s. 10d. per ton to 29s. 1d., they were met by higher revenue.

The footage of development on the mine of 5,906 ft. showed an increase and of the 4,660 ft. sampled, 40.3 per cent proved payable averaging 5.9 dwt. Ore reserves amounted to 186,000 tons of 2.7 dwt. at the end of 1950.

## ORANGE FREE STATE INTERESTS

"Johnnies" has been to the forefront in opening up the O.F.S. goldfield, and was the first to claim ground around Odendaalsrus. In 1944 it formed the Free State Development & Investment Corporation Ltd., colloquially known as "Freddies" to acquire the properties of the J.C.I. and its associates in the new field.

Originally options and participations were acquired over 360,900 morgen in various areas of the Free State but after carrying out survey and exploratory work, it abandoned ground considered to be uneconomical. The most promising farms retained totalled 168,280 morgen, equivalent to nearly 220,000 mining claims. A morgen is equivalent to 2.11 English acres, so that the extent of the company's huge area will be appreciated.

The principal asset amongst these big holdings was the option over the mineral rights of 12,600 morgen surrounding and to the north of the township of Odendaalsrus, which was the subject of an intensive drilling campaign for two years or more. Particular attention was paid to this Odendaalsrus block, covering an area of about 20 square miles. A grid system of boreholes was laid out and the programme was successful in proving that practically the whole of the farms in the area were underlain by gold-bearing formation.

This large area was split and two companies formed in June, 1947—Freddies North Lease Area and Freddies South Lease Area, each having an initial authorized capital of £5,400,000 in shares of 10s. each, since increased to £6,500,000 in each case. "Freddies" shareholders were given the right to subscribe for shares in each company at par, together with options to subscribe for further shares.

The properties form a rough diamond in shape with Odendaalsrus as the centre. "Freddies" retained its other interests in the field and reports, from time to time, the result of exploration and drilling. Portions of its option areas in the Virginia-Sand River district were included in the lease area of Virginia Gold and as consideration for the cession of the area to that company "Freddies" received (*a*) £50,741 15s. 0d. which was utilized in subscribing for 202,967 5s. stock units of Virginia Gold at par; (*b*) the right to subscribe and/or find subscribers for 703,532 5s. shares at par and for £236,224 First Mortgage Debenture Stock of that company.

The company's investments at March 31, 1950, had a book value of £882,970 out of assets of a total book value of £1,584,818. These investments comprise Freddies North (838,223 shares of 10s. each and 6,676 options), Freddies South (825,000 shares of 10s. each and 621 options), and Virginia (O.F.S.) Gold (202,967 stock units of 5s. each), and shares in a co-operative concern costing £617. Further shares have been acquired in the Virginia since March 31, 1950 as a result of the issue made by that company.

A "Corridor" agreement between Freddies, its two operating companies and Odendaalsrus Gold General Investments and Extensions (known as Oggies) mainly providing for land for township purposes has entitled Freddies to receive £37,500 in cash, 300,000 "Oggies" 5s. shares and options on a further 300,000 "Oggies" shares at 5s. 6d. each on or before June 30, 1952.

Freehold property stands in the balance sheet at £209,691, and the company is engaged in drilling operations to test these areas. They are spread over the new goldfield and drilling results are watched with much interest.

On White's farm in the Ventersburg district, drilling jointly with New Consolidated Free State Exploration has intersected the Basal Reef. Other results have given much encouragement. A few farms in the company's Vaal River block are likely to become of value as they contain the Vaal reef at mineable depth, and options will doubtless be exercised in due course. As regards ground north of Freddies North Lease area, it is considered that exploration may be more satisfactorily carried out by development headings from Freddies North. But this is a project for the future.

Freddies has also entered into contract with a number of other companies giving them various participating rights in flotations that may result from any of the ground taken over from them.

The company increased its capital this year to £1,000,000.

## FREDDIES NORTH LEASE AREA

The lease of ground ceded to Freddies North covers approximately 5,127 claims situated to the north, east and west of Odendaalsrus. Drilling results from the nine boreholes put down have indicated the existence of gold-bearing formations, the most important being the Basal Reef which was intersected in 6 out of 10 boreholes, with values ranging from 0.8 to 552 in.-dwt. at depths of from 4,873 to 5,516 ft. It is noteworthy that in 3 boreholes the initial values were considerably below the deflection values. The estimate of eventual mining values in relation to borehole results has led to the belief that the mine, like that of the South Lease Area, is destined to be a relatively low-grade, large tonnage proposition. A 100,000,000 tons of ore would give a 40-year life to the mine on a milling basis of 200,000 tons per month but initial crushing will be at one-quarter of the ultimate rate.

The property is being opened up by two shafts which at the end of last year had reached respective depths of 4,259 ft. for No. 1 shaft and 3,112 ft. for No. 2 shaft.

The No. 1 shaft is expected to intersect the Basal Reef at about 5,400 ft. and in No. 2 the reef is expected to be cut at around 5,100 ft. Both shafts will be sunk to a final depth of 5,600 ft.

The intersection of water-bearing fissures has delayed sinking but permanent headgear has been erected as also the installation of sinking hoists. The erection of surface buildings has been proceeding for the staff and for administration purposes, and also for providing power facilities for mining work.

The company's annual report for 1950 gave a review of the progress that had been made during the year both in connection with shaft sinking and surface work. Winding and compressor plant are being installed and a start has been made with excavating the foundations for the reduction plant. Cottages have been built for European employees and the construction has commenced of 50 houses in a proposed extension of Odendaalsrus Township.

Owing to the proximity of Freddies North and Freddies South Lease Areas certain services are being provided for the mutual benefit of the two companies. Stores fall within this category while the electric turbo compressor plant being installed is for the use of the two mines.

## FREDDIES SOUTH LEASE AREA

Freddies South, like its sister undertaking is engaged in the somewhat unspectacular work of shaft-sinking. It is erecting surface buildings for staff and administration purposes and providing power facilities for mining work.

The property is situated to the east, west and south of Odendaalsrus and its actual claim area is slightly smaller than that of Freddies North, consisting, as it does, of 5,066 claims.

Nine boreholes put down have indicated the existence of payable gold-bearing formation, the Basal Reef occurring between 5,000 ft. and 7,000 ft. There has been a disposition to regard this area with more favour as drilling values were rather better, while part of the property to the south juts into the rich Geduld area.

The two shafts being sunk are similar to those of Freddies North, but progress has been retarded by intersection of water-bearing fissures. Each has a hoisting capacity of 200,000 tons per month. At the end of last year, No. 1 shaft was at 3,315 ft. It is expected to cut the Basal Reef at about 5,400 ft. and will be sunk to 5,600 ft. At the same date No. 2 shaft had reached 3,781 ft., and is expected to intersect Basal Reef at about 5,500 ft. It will have a final depth of 5,700 ft. This latter shaft is sited on borehole KK7 where the Basal Reef was located at 5,534 ft. with values of 226.5 and 389.2 in.-dwt. The first intersection of Basal Reef is expected very shortly.

Preliminary construction work on the reduction plant was started, towards the end of 1950. The mine is scheduled to be a large-tonnage producer with an ultimate output of 200,000 tons per month.

Apart from shaft sinking, surface work has gone ahead including accommodation for European employees, while extensive additions have been made to the native compound. Work in connection with the permanent electric winders at both shafts has been in progress.

## FURTHER CAPITAL

Both Freddies North and Freddies South are assured of sufficient capital to carry them on until they are well into production. The position is that under arrangements made last year the authorized capital of each company was increased to £6,500,000 by creating 2,200,000 10s. shares in order to provide sufficient share capital to cover Loan stock conversion. This took the form of 5 per cent Registered Unsecured Convertible Loan Stock, 1953/60 and was offered to shareholders in each of the two companies in the ratio of 10s. stock for every four 10s. shares held in the respective companies.

The offer involved £1,273,463 of stock in the case of Freddies South and £1,247,959 for Freddies North. For both companies each 10s. of Loan stock will be convertible into one 10s. Ordinary share from the date of issue until December 31, 1952. Otherwise the Loan stock will be repayable at par at the end of 1960, although unconverted stock may be redeemed at 10s. 3d. for each 10s. stock between January 1, 1953 and December 31, 1960.

# General Mining & Finance Corporation

THE association of Messrs. G. & L. Albu with the early days of the Rand was responsible for the bringing into being of the General Mining & Finance Corporation Ltd. This concern became a public company in 1902 although it had been functioning, on a small scale, for about seven years previously. It has devoted its energies principally to Rand gold mining and has brought into production gold mines which will never be forgotten, although several of them have long since closed—Cinderella, New Goch, Roodepoort United and the famous Meyer & Charlton which, at one time, was the richest mine on the Central section of the Rand.

Although to-day the Corporation is only responsible for the administration of two of the Rand producers, it has acquired a substantial portfolio of investments. They are principally in first-class Rand dividend payers and include East Rand Proprietary, Durban Deep, Crown Mines, and a preponderating holding in West Rand Consolidated, which is also under its administrative and technical control. As the result of a deal with Consolidated Rand Investment Trust, it has also become responsible for the management of South Roodepoort Main Reef now included in its group.

As with other of the Kaffir houses, the Corporation is taking an active part in the development of the Orange Free State. Soon after the end of the war it formed the General Exploration Orange Free State Ltd. to take over option areas and properties in the new field, while simultaneously it has become interested in other O.F.S. undertakings, and has now a large and interesting spread.

A feature of interest in connection with the Corporation is that for more than a decade its dividend and profits record have been remarkably consistent. Total revenue for 1950 amounted to £638,806 and the profit of £513,000 compared with £462,856 the previous year. For the fifteenth consecutive year the dividend was maintained at 25 per cent (5s. per £1 share). The book value of investments was £4,131,000, the aggregate market value of which was stated to be substantially in excess of the balance sheet figure.

The issued capital has increased to £1,677,286 out of an authorized amount of £2,000,000 in £1 shares.

## WEST RAND CONSOLIDATED MINES

The long-term prospects for West Rand Consolidated appear to be particularly promising. The company is developing five reefs and a new plant is being erected to deal with 40,000 tons of ore a month from the White and Monarch reefs of the Bird reef series. Sufficient development has been carried out to justify this rate of milling from these ore bodies, thus permitting the existing plants to be used for the treatment of ore from the Main, Livingstone and Kimberley series.

The mine is one of the four Rand producers that will be responsible for initial production of uranium under the terms of the arrangement with the S.A. Atomic Energy Board, announced towards the end of last year.

The company's 1950 report made a very satisfactory showing. There was an improvement in the pay percentage of the Main and Kimberley Reef series, with slightly lower value; the Livingstone series showed an increased pay ratio with slightly higher value, while on the Bird Reef both value and pay percentage were rather lower. Results for the past two years have been:

| | 1949 | 1950 |
|---|---|---|
| Tons milled ..... | 2,546,000 | 2,602,000 |
| Total yield (oz.) ..... | 418,020 | 422,965 |
| Yield per ton (dwt.) | 3.284 | 3.251 |
| Revenue per ton (sh.) | 33.3 | 42.2 |
| Costs per ton (sh.) ... | 22.8 | 24.6 |
| Profit per ton (sh.) ... | 10.5 | 17.6 |
| Development footage | 75,395 | 85,675 |
| Ore reserves: | | |
| Tons ..... | 10,093,000 | 10,047,000 |
| Value (dwt.) ..... | 3.6 | 3.5 |
| Width (in.) ..... | 48 | 48 |

The total working profit last year amounted to £2,291,979 against £1,335,446. Taxation called for £1,001,396 and capital expenditure £171,231. Dividends paid totalled 2s. 9d. per share against 2s. the previous year, which called for £584,375.

## SOUTH ROODEPOORT MAIN REEF

The property of the South Roodepoort is situated to the south of West Rand Consolidated, and the company has the mining rights of the Contact Reef and any other reefs in the Elsburg Series, together with additional mineral rights.

The capacity of the plant has been raised to 26,000 tons a month, and this throughput was attained during the financial year to June 30, 1950. The following is a comparative table of results:

| | 1948/49 | 1949/50 |
|---|---|---|
| Tons milled ..... | 244,100 | 281,600 |
| Total yield (oz.) ..... | 63,915 | 68,397 |
| Yield per ton (dwt.) | 5.24 | 4.86 |
| Revenue per ton (sh.) | 45.3 | 58.0 |
| Costs per ton (sh.) ... | 36.4 | 39.0 |
| Profit per ton (sh.) ... | 8.9 | 19.0 |
| Development footage | 11,377 | 13,469 |
| Ore reserves (Total): | | |
| Tons (including shaft and safety pillars) | 712,000 | 1,103,000 |
| Value (dwt.) ..... | 5.1 | 4.4 |
| Width (in.) ..... | 52 | 53 |

The working profit was £269,523, which compared with £109,779 the previous year. Dividends totalled 1s. 9d. per share, which called for £124,308.

## DURBAN ROODEPOORT DEEP

This old-time producer of the Rand is operating on Main Reef and South Reef and although it has been in existence over fifty years, still has a good lease of life. It was fortunate in being able to acquire claim areas on the dip of its old property which enabled a big expansion programme to be initiated in 1934 when the New Steyn was acquired.

Good tonnages of ore are being obtained from both the reefs being explored and as a consequence reserves have been built up. The Main reef is the chief ore carrier where both percentage payability and values are fairly consistent.

A programme of shaft sinking has gone forward and in particular progress has been made with the project for the sinking of an incline shaft in the central portion of the mine to facilitate Kimberley reef development. It is hoped to link up with the old Great Britain mine in the eastern part of the property where the Kimberley reef exists.

During 1950 the tonnage crushed amounted to 2,132,000 tons as compared with 2,026,000 tons the previous year. The average value was 3.45 dwt. per ton and revenue per ton advanced to 43s. 9d. as against 36s. 7d. Working costs were 30s. 6d. per ton compared with 28s. 1d., while the profit per ton rose to 13s. 3d. The total working profit amounted to £1,409,622 as against £861,093. Development footage amounted to 81,128.

Available ore reserves at December 31, 1950, were 9,312,000 tons, value 4.2 dwt. over a stoping width of 62.1 in.

Dividends declared last year amounted to 5s. 9d. against 3s. 9d. per share.

## EAST RAND PROPRIETARY

This Central Rand producer which was originally formed by Sir George Farrar, is more than fifty years old. Nevertheless, its prospects are still sufficiently good to have warranted a large-scale financial operation which was carried out last year by the issue of 360,000 new 10s. shares at 62s. 6d. each, offered to shareholders in the proportion of one new for every ten held.

By means of this share issue the company raised approximately £1,100,000. A further £3,350,000 required for the capital programme over the next few years will be appropriated out of profits which, provided costs do not increase abnormally, is not expected to impose a strain on revenue to the point of compromising dividends.

The programme of work envisaged consists of the sinking of various shafts for the purpose of extending the mine in depth and working the large aggregation of ore expected to be found in the central and south-eastern sections of the property. An additional mining lease has been obtained on the southern boundary of the mine and it is estimated that workings in this region will reach a depth of 10,000 ft.

During 1950, the mine crushed a slightly higher tonnage—2,653,000, the grade being 4.027 dwt. Revenue per ton rose by 7s. 8d. to 50s. 10d. but nearly half of this increase went to meet the 3s. 7d. per ton rise in costs at 32s. Working profit of 18s. 10d. was 4s. 1d. higher and the total of £2,502,816 showed an increase of £546,052. Taxation called for £310,451 more at £860,829 but capital expenditure was lower at £537,457. Dividends totalled 5s. against 4s. 3d., absorbing £945,000 and there was a surplus of £139,556 from the year's operations.

Development footage for the year was 54,340 ft. against 61,347 ft. in the previous year. Available ore reserves at December 31, 1950 were 7,055,000 tons, value 4.8 dwt. over a stoping width of 48.4 in. This compared with 8,430,000 tons of the same value.

## GEOFFRIES

In the opening up and development of the Orange Free State goldfield, the General Mining is contributing its quota of money and effort mainly through the instrumentality of its subsidiary —General Exploration Orange Free State Ltd. ("Geoffries"). Options are held over large areas of ground with mineral rights in the Bothaville, Hoopstad, Kroonstad, Ventersburg and Winburg districts which in extent approximate 61,000 morgen. A programme of drilling operations has been proceeding over widespread farms, and some very interesting results obtained.

Simultaneously with exploration work and drilling operations, the company has acquired share interests in the two "Freddies." They consist of 212,625 shares in Freddies North Lease Area Ltd. and 425,148 shares in Freddies South Lease Area Ltd. as well as Convertible Loan Stock in both these companies. Participation rights were exercised in the subscription for the initial capital of the Virginia and Merriespruit flotations. "Geoffries" has another asset in an option until June 30, 1952, to subscribe for 150,000 shares of 5s. each at 5s. 6d. per share in Odendaalsrus Gold, General Investments and Extensions Ltd. This was obtained with a cash consideration of £25,000 for the purchase of the company's rights and obligations over the surface of the Odendaalsrus Townlands.

The company's authorized capital remains at a figure of £1,000,000 of which £605,625 had been issued at the end of last year. In 1949 an amount of £250,000 was raised by an allotment of 120,000 reserve shares at 42s. per share to Van Ryn Gold Mines Estate. To further augment the company's resources, an offer was accepted in April of this year by Anglo American Corporation to subscribe in cash for 500,000 reserve shares, at 24s. each which has brought a further £600,000 into the coffers of the company and increases the issued capital to £668,125.

The main interest in "Geoffries" properties is still centred on its areas lying some four to five miles north-west of Odendaalsrus. There are several farms—Rosedale, Spes Bona, Weltevreden, Welgevonden and S/D1 (Te Vrede) of Spes Bona 921. Also of importance is the interest in a large area to the west of the new undertakings, Loraine and Jeannette, which takes in the farms Graspan, Welvaart and Onrust, all of which are well thought of. In the Virginia and Sand River area the company has promising rights in the farm Florida, while further east, it has the farm Memoriam. These areas have yet to be explored and tested before any opinion can be given of their potentialities.

## ODENDAALSRUS INTEREST

Drilling has been proceeding on farm Van den Heversrust, situated to the north-west of Odendaalsrus where operations have been carried on both by the company and jointly with Middle Wits. Over three years ago, when drilling on the area was in its early stages, a series of gold-bearing bands with values of up to 1,652 in.-dwt. was struck in a borehole on this farm. No positive deductions were made from the intersections as there was no correlation of the reef bands with any recognized horizons in the Free State. However, they opened up interesting possibilities for the whole of this area where the geology is highly complicated.

Now a recently reported strike has again focused attention to this area. A borehole TV3 put down 500 ft. west of a line joining VDH1 on Van den Heversrust and TV2 (Te Vrede) of Spes Bona—in both of which the same intriguing Rainbow reefs were encountered—gave interesting results. It picked up the rich bands and values ranged from 163 to 4,118 in.-dwt. The drill passed through the Ventersdorp lower lava at 4,690 ft. Core recovery was complete. Further drilling met other conglomerate bands assaying 5.7 dwt. over a width of 36 in., equivalent to 205 in.-dwt., 10.9 dwt. over 15 in., and 3.1 dwt. over 40 in.

These results, so far as can be judged, indicate that the series occurs in a long narrow "sandwich" possibly extending over some 2¾ miles of strike but having a comparatively limited extent on the dip of the reefs.

Other boreholes—VDH4 and VDH4a—have been put down, but did not strike the upper reefs. In the former the "A" reef appeared at 5,071 ft., the Leader at 5,794 ft. and the Basal at 5,873 ft. The main block of upper reefs in VDH1, just over half a mile to the north-west of VDH4a was cut between 5,241 ft. and 5,306 ft.

It is anticipated that a company will be floated to work these rich and extensive upper reefs in conjunction with the more normal Basal and Leader reefs lower down.

Additional emphasis has been given to the possibilities of the location of these farms by reason of the fact that other boreholes on farm Bandon indicated that the sub-outcrop of the Basal reef lies further to the west than was at one time expected. This consequently further underlines the potentialities of "Geoffries" farms.

An agreement was recently entered into by the company with Anglo-Transvaal Consolidated, General Mining, and Middle Wits for the pooling of ground contiguous to that on which the results of boreholes have created so much interest. In the event of it being decided to apply for a mining lease, the first company to be formed will be under the administration of Anglo-Transvaal. "Geoffries" and Middle Wits will participate in vendor and subscription rights. Any areas not included in the first lease, shall be included in a company under the administration of General Mining and Finance and vendor and subscription rights shall be based pro rata to estimated payable tonnage contributed by the participants.

## GRASPAN AND ADJOINING FARMS

Further to the north of "Geoffries" block of farms lies Graspan. It is actually positioned to the south-west of the Wit Extensions ground which has been taken over by the Loraine Gold Mines.

Results of boring on Graspan have not been of the same intriguing nature as those of Van den Heversrust; they have been undertaken in conjunction with East Rand Consolidated and have contributed interesting information regarding the potential mineralization of this area.

Several deflections were made in borehole GG.1 on Graspan and trouble has been encountered owing to caving, in faulted sediments.

Other work has been proceeding on this large area of ground to the north-west of Odendaalsrus. The various farms are under option to different interests and arrangements have continued for joint drilling. Boreholes on Spes Bona have been put down on joint account with Middle Witwatersrand (Western Areas). On Diamant No. 1370 drilling has been continued by Wit Extensions on joint account with "Geoffries" and on farm Holfontein No. 148, drilled by Lydenburg Platinum on joint account with Middle Wits and "Geoffries."

The bringing into being of some thirteen mines, spreading from Wit Extensions area in the north to below Virginia, south of the Sand river, has rather obscured the drilling operations of the various companies. But exploratory work of this nature is still continuing over practically the whole field. It is most important that it should do so as the extent and limitation of the gold-bearing formation is not, by any means, yet known.

There is, moreover, still some confusion with regard to the reefs which are being intersected. As regards the Basal Reef itself, according to Vivian Baines, in a paper presented to the Geological Society of South Africa, the Basal Reef found in the O.F.S. and the Vaal Reef are considered to be one and the same reef. Furthermore, the Vaal-Basal horizon falls either within the Bird Reef group, or alternatively, in the Main Reef group of conglomerates.

In the Orange Free State the gold occurs in conglomerate beds similar in character to the sedimentary depositions found on the Rand where experience has proved that reliability can be placed on results obtained by borehole operations. This is clearly a point of some importance in assessing the large area of ground in which "Geoffries" is interested, and having regard to the borehole results to date, it would seem reasonable to assume that the company has a very large area underlain by payable reef formations.

## SAND RIVER

In the Sand River area "Geoffries" has a spread of interests which are somewhat complicated by reason of their being held in conjunction with other parties. Their potential, however, is not affected on this account. Mineralization of the area has been proved beyond any doubt and the ground below the river may eventually open up another gold field.

The total option area in which the company is interested in this part of the O.F.S. extends to some 7,500 morgen and drilling on various farms has indicated that mineral wealth lies at favourable mining depths.

## POTENTIAL COAL RESOURCES

The existence of coal on the company's farms in the Free State which was discovered some two years ago evoked much interest, though no surprise, as big deposits were known to exist south of the Vaal River in the Vierfontein area. The farms underlain by coal horizons with which "Geoffries" is connected are the Spes Bona No. 921, Weltevreden No. 205 and Welvegonden No. 1183. Deep drilling for gold has given positive indications of coal and seams varying in width at different depths have been discovered. The depths and thickness of the seams put the occurrences within economic limits, and the calorific values are believed to be of the same order as the calorific value of Vierfontein coal. There is hope that the extent of the horizons will persist through an area of ground sufficient to warrant the development of a coal mine or mines. Up to the present time the seams have been only of geological interest but there is reason to hope that they will prove to be an economic proposition. The establishment of coal mines and gold mines on adjacent ground, as has been the case in certain areas on the East Rand, would, of course, greatly enhance the value of the property.

# Union Corporation Ltd.

ALTHOUGH Union Corporation came into being as such as late as 1918, the undertaking had already been operating under its original title of A. Goerz and Co., for over 20 years, having been registered in 1897—the year of the Diamond Jubilee.

A. Goerz and Co., were associated with a number of old mines, worked in the 'eighties before modern scientific mining and metallurgical methods were known. May Consolidated, Princess Estate and Lancaster West were three such undertakings but they were worked out before Union Corporation took over. There was not the choice of further ground on the Central Rand and it was necessary to seek and explore beyond the then known limits of the Rand. The Far Eastern section of the field was selected—a comparatively unknown and difficult territory—but in the event this area proved to be well worth the efforts required and the disappointments suffered in the early days, and to-day the Union Corporation stands as one of the pioneers of the Far Eastern Rand. From this rich section Geduld, East Geduld and Modder Deep provided the original basis for the Corporation's prosperity, and are discussed in some detail below.

As a mining-finance house, the Corporation has interests far outside the Rand. It has widespread holdings in base metals, and took an early interest in the Northern Rhodesian copper belt. In the past it has ventured into Australia, and has participated in the Trepca Mines, now taken over by the Yugoslav Government. To-day it is associated with the well-known San Francisco Mines of Mexico, of which it has administrative control, and which has become a prosperous silver-lead-zinc producer. It has also staked large sums in the diamond fields of Sierra Leone.

Several exploration and prospecting subsidiaries have been formed by the Corporation. The Potchefstroom Mining Areas was brought into being to facilitate operations in connection with contracts held over ground in the Potchefstroom district of the Transvaal. Some of the interests held in this area were ceded to the Stilfontein Gold Mining Company and as a result Union Corporation has a large shareholding in this interesting Klerksdorp undertaking.

Chrome Mines of South Africa is another venture in which a large interest is held. This company is mining for chrome ore in both the Rustenburg and Lydenburg districts of the Transvaal. Substantial tonnages have been produced and sold to overseas buyers.

The Central Mineral Exploration Co. was formed in Tanganyika and is carrying out useful work in surveying a large concession south of Mpanda.

The Corporation staked an early claim in the Orange Free State. It obtained options and prospecting contracts over farms in various districts including Kroonstad and Bothaville. It co-operated with other interests in prospecting and drilling and has become responsible for the administrative and technical control of the St. Helena Gold Mines, which was the first mine to begin shaft sinking, and which plans to commence milling early in the latter half of this year. The prospects for this company are discussed on the next page.

As with other South African finance houses, the Corporation has acquired commercial and industrial interests outside the mining industry. In this connection reference must be made to the Bay Hall Trust, a subsidiary formed in 1934 to take over a number of industrial holdings, British Enka, and South African Pulp and Paper Industries, a company which has greatly increased its output in the past year or so.

The annual report of the Corporation has come to be regarded as something of an event in City circles beyond those which are financially interested in its progress. In recent years it has given interesting brief surveys of the progress of the South African gold mining industry in particular and of world gold production in general, the Corporation's annual estimate of world production and consumption and stocks being one of the few authoritative sources.

Earnings for the year ending December 31, 1950 showed a slight falling off. Gross profits amounted to £1,477,719, a decline of £28,951 from the preceding year, but the amount provided for U.K. income tax and profits tax was smaller at £550,400—a reduction of £125,200, so that the net amount available after tax, was £96,249 higher at £927,319. After placing £300,000 to reserve —an increase of £100,000—the total distribution for the year was repeated at 6s. per share free of U.K. tax, or 48 per cent, compared with earnings of almost 80 per cent. This called for £558,000 and left a balance of £69,319 from the year's profit which was added to the carry forward at £282,327.

## GEDULD PROPRIETARY MINES

The property of Geduld Proprietary Mines Ltd., on the Far Eastern section of the Rand is now surrounded by other mines, although at one time it stood alone. It has proved a most successful enterprise since its start in 1899 and although not proving so rich as some of the neighbouring producers, has been a consistent dividend-payer. The gold bearing reef is the Main Reef Leader which underlies all the properties on this part of the field.

Milling commenced in 1908 and since then to the end of December, 1950, the tonnage crushed has amounted to 36,811,239 tons for a net total profit of £24,747,422 while the amount distributed in dividends has been £22,963,867 equivalent to 1,616 per cent on the company's capital of £1,460,857.

The company has substantial shareholdings in the much newer East Geduld and Grootvlei Proprietary Mines—both of which interests it received in consideration for the transfer of mining rights and derives a large proportion of its revenue by way of dividends from these two undertakings.

During 1950, the tonnage crushed showed a slight increase at 1,279,000 tons compared with 1,257,500 tons, but grade was lower by 0.53 dwt. at 3.05 dwt., as a result of the reduction of the pay limit following devaluation. Nevertheless, with the higher sterling gold price, revenue per ton improved to 38s. 7d. against 35s., and although working costs rose by 2s. 2d. to 27s. per ton, the working profit per ton was higher by 1s. 5d. at 11s. 7d. The total working profit was £742,186 against £639,562 and dividend income increased to £824,896 as compared with £583,054. Two dividends were paid totalling 16s. 6d. against 11s. 9d.

Development work on the Black Reef continued during the year, but the percentage payability and value were lower than for the previous year, although the total footage accomplished increased to 16,168 ft. against 13,712 ft. Of the 11,445 ft. sampled 1,865 ft. or 16 per cent proved payable with a value of 226 in. dwt.

The total ore reserves showed a diminution of 600,000 tons to 4,000,000 tons, value 3.40 dwt. over a width of 51 in.

## EAST GEDULD MINES

Positioned to the east of the Geduld Proprietary, East Geduld Mines Ltd., is a high-grade producer with a long life before it. Early development was facilitated by drives from the neighbouring Geduld mine and as a consequence its opening up was expedited. Simultaneously with this underground work a vertical shaft was sunk and developments having given satisfactory results, a crushing plant erected. Milling commenced in 1931 and during the past 20 years' operations 30,546,800 tons of ore have been milled for a profit of £21,451,725. Dividends paid have so far totalled £19,505,500.

During 1950 a slightly lower tonnage of ore was dealt with at 1,738,000 tons compared with 1,754,000, the average grade being unchanged at 5.99 dwt. Post devaluation revenue per ton rose by 17s. 2d. to 76s. and was well able to absorb the increase in working costs which at 24s. 2d. showed a rise of 3s. 8d. per ton. The profit per ton worked out at 51s. 10d. as against 38s. 4d., while the total working profit at £4,505,015 compared with £3,358,891 in the previous year. The increased profit brought with it a bigger tax liability amounting to £2,330,350 against £1,611,353.

Income from investments, which include a share interest in the Grootvlei Proprietary Mines, also provided higher revenue amounting to £83,586 or some £30,000 more than previously.

The company was consequently able to pass on to shareholders the benefit of its bigger income and distributed 4s. 7½d. per 4s. unit of stock, equivalent to a dividend of 115.6 per cent compared with 82.5 per cent in 1949.

Rather more development was done and the footage accomplished amounted to 17,496 ft. Of the 10,440 ft. sampled, 65 per cent proved payable (against 58 per cent the previous year), the value being also higher at 284 in.-dwt.

There was no change in the ore reserves which remained at 12,500,000 tons of 5.7 dwt., but the stoping width was narrowed to 51 in.

## GROOTVLEI PROPRIETARY MINES

This company was formed in 1904 to take over mineral rights on an area of ground to the east of East Geduld. It has since acquired additional claims and in 1941 took over the Palmietkuil Gold Mining company's property which, it will be recalled, was a large one on which a fair amount of work had been done, two vertical shafts having been sunk and equipped, for £245,000 in cash plus 134,704 Grootvlei shares. Its acquisition by Grootvlei

for £245,000 took place during the war when things were very difficult for the gold mining industry in South Africa and when it was almost impossible to obtain new money for mining enterprises. At the time both Grootvlei and Palmietkuil were in want of additional money for capital work and the merging of these properties proved to be of mutual help to both enterprises and their shareholders.

The company owns mineral rights (excluding coal) over an area of 3,423 morgen on farm Grootvaly 5, and precious metal rights over an area of 4,468 morgen on farm Palmietkuil 10. Of this area the company has mining rights over 6,624 claims, of which 5,393 are leased from the Government in return for a percentage of the profits.

During the 12 years Grootvlei has been in production up to the end of 1950, the tonnage milled has amounted to 21,457,500 tons, for a revenue of £48,731,832 gold. Net profits have totalled £12,124,349 and dividends paid £10,435,067 or 366¾ per cent.

The plant which originally had a capacity of 60,000 tons monthly, has been increased and can now deal with up to 200,000 tons per month.

Developments have gone forward with very encouraging results and, as expected, the Grootvlei section of the property has shown a higher yield than the Palmietkuil.

During 1950 the mine set up production records. Construction work on the reduction plant extension was completed during the year and the ore milled reached the highest ever of 2,267,000 tons. Although the grade was lower at 4.57 dwt., the revenue increased by 8s. 6d. to 57s. 8d. per ton. Profit per ton rose by 7s. to 33s. 6d. The total working profit was the highest yet achieved and amounted to £3,800,115, compared with £2,736,729 in 1949. Taxation called for a larger amount (£1,917,028) but capital expenditure was lighter at £21,963.

Development footage increased to 60,535 and of the 42,555 ft. sampled, the payable portion equalled 55 per cent and the average value 226 in.-dwt.

There was again a big increase in the aggregation of ore reserves which at 15,000,000 tons are equal to about seven years' milling.

## VAN DYK CONSOLIDATED MINES

The property of Van Dyk Consolidated covers an area of 5,790 claims. It is situated on that part of the Rand which has always been a fascinating geological problem—to the south of what was known as the Boksburg Gap. The mine is in the somewhat unusual position of being both a producer and developer. In its present form it has been in existence since 1934 and has paid several dividends but it was decided in 1946 that shareholders' best interests would be served by suspending payments and conserving profits for financing the No. 5 shaft sunk to open up the southern portion of the mine. Attention hitherto had been directed to the northern section which attracted early development as it carried the reef at the shallower horizon.

The sinking of the new shaft was completed last year but its equipment and preparations for exploring the deep levels have taken many months, and only a comparatively small amount of development footage has, as yet, been accomplished. An active development programme is planned and the ground coming under examination falls between the encouraging deep levels of the neighbouring mines and the high-value borehole V.S.6 in the south-west of the property. This borehole gave a value equal to 769 in.-dwt. in 1947, and it is felt that this is hardly likely to be an isolated patch.

During the year 1950 the development footage accomplished amounted altogether to 42,891 ft., of which 28,650 ft. were sampled, the pay percentage being slightly higher than in the previous year at 24 per cent, while the value was lower at 177 in.-dwt.

The tonnage milled last year was slightly lower at 1,197,000, the yield being 3.0 dwt. Revenue per ton was higher by 4s. 3d. but the major portion of this went to meet the increase of 3s. 9d. in working costs at 32s. 2d. per ton milled; hence profit per ton was only 6d. higher at 5s. 8d. The total working profit was £340,264 and after taking into consideration sundry income and expenditure, the net profit figured out at £331,322, which was allocated to expenditure account. Only a nominal amount of £8 was called for in taxation. Capital expenditure amounted to £342,227.

Since operations commenced in 1938 to the end of 1950 the tonnage milled has amounted to 14,506,400, for a net profit of £4,535,475. Up to 1946, dividends paid amounted to £2,612,500 or 95 per cent.

## MARIEVALE CONSOLIDATED MINES

The comparatively young Marievale mine lies on the eastern rim of the Far Eastern Rand. The bulk of the ground lies further east on the field than any of the other properties and as a consequence the work in exploring the reefs is of particular interest. The small south-western portion of the property has been severed by a major fault but this is regarded as being unimportant. However, chief interest attaches to the northern section where there are indications of the rich shoots of neighbouring mines.

The principal development, so far, has been on the Main Reef, but the Kimberley Reef is being explored from Nos. 1 and 5 shafts. The new No. 5 shaft serves the north, central and eastern section of the property.

The total footage accomplished during 1950 on the Main and Kimberley Reefs amounted to 34,366 ft., which was much in advance of that for the previous year. The payability of the Main Reef was lower at 43 per cent but that on the Kimberley rose from 12 to 25 per cent. Underground exploration of this latter horizon continued throughout the year and a pay zone of approximately 1,600 ft. in length was located from the 7th level west drive.

The tonnage milled of 725,500 tons was the highest yet dealt with and resulted in a record working profit of £984,615. The yield was lower at 5.03 dwt. but revenue per ton, with gold at its post-devaluation level increased by 7s. 4d. to 63s. 7d. Unlike many mines of the Rand, which have had to meet higher rates of pay and allowances, Marievale's costs last year decreased by 4d. per ton to 36s. 5d. The profit per ton rose by 7s. 8d. to 27s. 2d. Taxation called for almost double that of the previous year at £432,101, but there was a larger net profit of £544,800. This enabled shareholders to benefit and the dividends were increased to 1s. 10d. per share as against 1s. 3d. the previous year.

A fairly large tonnage of ore from the Kimberley Reef was added to the reserves which increased by 200,000 tons to their highest figure of 3,000,000 tons of 5.6 dwt.

## ST. HELENA GOLD MINES

As is generally known, the St. Helena was the first Orange Free State mine to start mining work proper after the long initial programme of drilling.

The property consists of 8,244 claims on various farms all in the district of Odendaalsrus. The mineral rights of all the farms as well as ancillary and trading rights over some of them, are owned by the company.

Though being the first of the Orange Free State developing mines to get under way, St. Helena has had to face many difficulties peculiar to itself. The nearest railway siding was 27 miles away, while the nearest mechanical workshops of any importance were on the Witwatersrand, more than 150 miles away from the railway siding. Roads were bad and communications difficult. All these delaying factors have had to be overcome to bring the mine to its present advanced stage. Development has been somewhat impeded by water troubles but no exaggerated importance need be given to this factor.

A great deal of work has been done during the past 12 months and, so far as can be seen, the mine promises to begin milling in the second half of this year and to be the first to do so, subject to a number of factors which may hasten or delay the progress.

The plant will have an initial capacity of 50,000 tons, to be gradually increased to 80,000 tons. Any further extension will depend upon development results. These, so far, are satisfactory as the company's report for 1950 showed.

During the year both surface and underground work was advanced. Construction continued on the reduction plant, compressor house and ancillary workshops, offices, European and native quarters together with recreational facilities and amenities.

In the mine, the No. 4 vertical shaft was sunk to its final depth of 2,938 ft.; stations on the 2nd to 12th levels were cut and development consisted mainly in advancing the 2nd and 4th levels southwards, completing raise-winze connections between the 2nd and 4th levels and winzing from the 4th level to the 6th level elevation. Driving was done both north and south on the 6th level from the bottom of two of the winzes. Severe faulting was encountered in the vicinity of No. 4 shaft. Large quantities of water were encountered; indeed, development generally was impeded by the intersection of water-bearing fissures, necessitating sealing by cementation, and this accounted for low development on the Basal Reef. The total footage for the year was 12,406 ft., and of the 3,865 ft. sampled on the Basal Reef, 2,595 ft., or 67 per cent were payable, having an average assay value of 13.0 dwt. over a width of 25 in.

No calculation of ore reserves has yet been made due to the limited amount of development done. It is considered unlikely that development will have progressed sufficiently to enable the reduction plant to be supplied by the middle of this year with ore on the substantial scale originally planned. It should, however, be ready to go into commission early in the second half of the year in the expectation that adequate electric power will be available.

# Anglo-Transvaal Consolidated Investment Co., Ltd.

THE Anglo-Transvaal Consolidated Investment Co., Ltd., controls the Virginia and the Merriespruit gold mines situated at the south-eastern extremity of the new Orange Free State goldfields, in which 13 mines are now in the course of being opened up. The two mines of the Anglovaal group, together with the adjacent Harmony gold mine, on the board of which Anglovaal is also represented, constitute "Sand River Block," and is in the vicinity of Virginia Station, on the main line between Johannesburg and Cape Town via Bloemfontein. The other ten mines are centred on the three towns of Allan Ridge, Odendaalsrus and Welkom. The geological strata in the Orange Free State goldfield are Karroo measures, Ventersdorp lavas, Ventersdorp sediments, followed by Witwatersrand quartzites, in which the economic gold-bearing horizons occur. In the Sand River area, the depth of the economic gold-bearing horizons varies from 1,450 ft. at the sub-outcrop on the eastern boundary of the Virginia property, to 7,000 ft. in the north-western area of the block. The average depth to reef within the major portion of the Virginia and Merriespruit lease areas is of the order of 3,500 ft.

## LEASE AREAS

The Virginia mining lease area extends over 5,355 claims, equivalent to 7,871 acres, and the Merriespruit mining lease area extends over an area of 5,830 claims, equivalent to 8,569 acres.

The salient particulars of the Virginia and Merriespruit mines are:

| | Virginia | Merriespruit |
|---|---|---|
| Mining Claims ..... | 5,355 | 5,830 |
| Acres ..... | 7,871 | 8,569 |
| Lease formulae ..... | $Y = 20 - \frac{120}{X}$ | $Y = 10 - \frac{60}{X}$ |

Y. is the percentage of profit payable to the Government and X is ratio of profit to recovery expressed as a percentage. This consideration is payable in addition to taxation on the mining profit.

## CAPITALIZATION

Both the Virginia and Merriespruit mines in their method of capitalization have followed a similar pattern. The authorized capital of each is £2,562,500 divided into 10,250,000 units of stock each of 5s. Of this, 9,000,000 units of stock of 5s. have been issued, leaving in reserve 1,250,000 units of stock of 5s. each, equal to £312,500.

In each case, £2,000,000 of first mortgage debentures have been issued with a right of conversion up to 25 per cent of the total held into Ordinary stock at a premium of 60 per cent on the par value of the Ordinary stock, for five years.

In each case, Kennecott Copper Corporation of the United States of America subscribed firm for 2,250,000 units of the 5s. stock. In addition, Kennecott underwrote the whole of the debenture issue for Virginia and subscribed firm for £500,000 of Merriespruit debentures and underwrote the remaining 1,500,000 balance.

This was the first occasion on which large-scale American capital had participated directly in the equity of a South African mining venture. The provision of nearly £5,000,000 from dollar sources represented an appreciable contribution towards stabilizing South Africa's balance of payments in her trade with America.

As a result of these financing arrangements the Virginia and Merriespruit mines each had available cash working capital of £3,750,000, sufficient to bring each mine to its initial production stage.

## CONJOINT OPERATION

Advantage has been taken of the adjacent situation of the Virginia and Merriespruit properties to follow a plan of conjoint operation. Services, such as compressed air, water supply, electric power, housing and recreational facilities are being shared. Equipment and methods have been standardized wherever possible. The success of this policy was apparent from the commencement of shaft-sinking operations on the Merriespruit property. The experience gained at Virginia in Shaft Collar installations enabled an appreciable saving in time to be made in the installation of the Shaft Collars at Merriespruit. In January, 1951, No. 1 shaft, Merriespruit, was sunk 351 ft., which constitutes a record footage sunk in any one month for the Free State goldfields.

Five circular shafts are being sunk on the two properties. All shafts are standardized at 24 ft. 1 in. diameter, inside the concrete lining. These shafts will enable underground development to proceed rapidly.

Active shaft sinking operations commenced on the two Virginia shafts in March, 1950. In September, 1950, the two Merriespruit shafts were commenced, and in October, 1950, the excavation for the third shaft on Virginia was started. This third Virginia shaft is expected to be the first shaft to intersect Reef, as it is situated on the eastern boundary of the property in an area where borehole information indicates the Basal Reef to be at a depth of approximately 1,450 ft.

At No. 1 shaft, Virginia, it is anticipated that Reef will be intersected at approximately 3,750 ft. No. 2 shaft is expected to intersect Reef at a depth of approximately 3,170 ft.

On the Merriespruit property the Leader-Basal Reef group will be intersected at a depth of approximately 4,500 ft. in No. 1 shaft and at 3,700 ft. in No. 2 shaft.

Shaft-sinking operations on the Virginia and Merriespruit mines are carried on continuously 24 hours a day, as is common practice throughout the Orange Free State goldfields.

There are three phases in a continuous cycle of operations. From the bottom of the shaft, at set intervals, a ring of long pilot holes are drilled down in the form of a fan to test the ground ahead for water-bearing fissures, and a cement-water mixture is injected. By this method, a cement-impregnated, water-tight zone of rock around and ahead of the shaft is achieved. After the pilot holes have been injected, the drilling crews, using compressed air jack-hammers, drill vertical holes 5 ft. deep in the shaft bottom. The number of holes to be drilled depends on the formation, but usually no less than 96 are drilled and charged with explosives and the "round" is detonated electrically. Fresh air is supplied to the shaft bottom by ventilating fans.

Periodically, steel shuttering is lowered to the bottom, placed against the rough rock walls, centred, and concrete is poured between the shuttering and the shaft wall to form a concrete lining. The function of the concrete lining is to support the shaft wall, and also, by providing smooth surfaces, to increase the ventilating capacity of the shaft.

## SURFACE LAYOUT

The reduction works, main offices, store and compressor house for the Virginia mine have been sited in the vicinity of No. 1 shaft, Virginia, which is planned as the main rock-hoisting shaft for the Virginia mine. A bridge has been built across the Sand River to afford direct road communication between Virginia No. 1 and No. 2 shafts.

At Merriespruit, the principal mine buildings will be near the Merriespruit No. 1 shaft. Permanent native quarters are being constructed near each of the five shafts now planned.

## THE PLANNING OF A NEW TOWN AT VIRGINIA

The siting of all dwellings and amenities provided by the two mining companies has been carried out with the view to ultimate incorporation in a modern town which will arise as a result of the opening up of the mines in the Virginia area.

It is anticipated that, by 1970, the town's population will reach 84,000—38,000 Europeans and 46,000 natives.

The monotonous flatness of the usual Free State countryside is relieved, in the Virginia area, by the bluffs of the Sand River, and the new town will grow up on both banks of the river. The town planners of the future town of Virginia have taken full advantage of this and other natural features.

## OTHER ORANGE FREE STATE INTERESTS

The Anglovaal group, in addition to its interest in the Harmony mine, also holds interests, and is represented, on the boards of the following seven Free State mining companies: Freddies North, Freddies South, President Steyn, President Brand, Welkom, Lorraine and Jeannette.

The group is also engaged in an active drilling programme through Middle Witwatersrand (Western Areas), Ltd., in other areas of the Orange Free State.

In the Van Den Heeversrust area drilling jointly with General Exploration Orange Free State, Ltd., is in progress.

Drilling to date has proved continuity of Basal Reef at workable depths, and with payable values, in this area. Payable values have been intersected in borehole VDH.1, TV.2 and K.1 in Upper Reefs within a zone above the Basal Reef horizon. These boreholes are situated approximately in a straight line, and extend over a distance of some 14,000 ft. The drilling programme in progress is designed to provide information as to the lateral extent of this occurrence, as well as further information regarding Basal Reef.

# The H.E. Proprietary Ltd.

## A Consistent Dividend Record

THIS mining finance company has widespread gold mining interests in undertakings as far apart as South Africa, Australia, New Zealand and Canada. Group profits for the year ending December 31, 1949, before taxation amounted to £188,465 against £179,850 for the previous year, while taxation also called for a larger amount, £106,364 against £84,216. Deducting amounts due to minority interests, the net profits of the group, after tax, were £74,973 compared with £88,329 in 1948, but £25,007 of this was retained by the subsidiaries, leaving the actual net profit of H. E. Proprietary at £49,966 compared with £55,709 the previous year. This figure more than covered the distribution which, as in the three preceding years, was maintained at 30 per cent and consisted of a 5 per cent interim dividend with a final of 15 per cent and a bonus of 10 per cent. These dividends and bonus absorbed an amount of £49,500 and left a balance of £466 which increased the carry forward to £116,055 against £115,559 in the previous year. Since then, an interim dividend of 5 per cent has been paid in respect of 1950.

### SOUTH AFRICAN ASSETS

The company's chief South African assets, apart from its holding in the Luipaards Vlei Estate & Gold Mining Co., are merged in the subsidiary, South African H. E. Proprietary, which holds shares in South African gold mining and industrial companies and has land and mineral rights.

The Luipaards Vlei company itself is under the technical control of the Consolidated Gold Fields of South Africa and has become one of the most successful Central Rand producers; its western boundary adjoins West Rand Consolidated. Progress was the keynote of this company's report to June 30, 1950. Tonnage milled was higher, as likewise profit per ton and working revenue. Owing to higher wages, costs trended upwards; they amounted to 30s. 1.9d. per ton—an increase of 2s. 6d.—on a milling tonnage of 1,235,000 giving a yield of 3.769 dwt. Revenue per ton was 45s. 10.3d. as against 34s. 0.5d. the previous year and the profit per ton of 15s. 8.4d. went against 6s. 4.2d. This resulted in the working profit being more than doubled at £969,225 compared with £383,447 in 1949, and taxation was consequently heavy at £306,203 against only £1,155 previously. Nevertheless the company was able to transfer £70,000 to General Reserve and step up the dividend to 2s. per share (100 per cent) as against 1s. 3d. Developments during the year under review were satisfactory; the footage accomplished amounted to 58,943 compared with 58,413, and payability was 66.5 per cent. Ore reserves were substantially increased by 450,000 tons to 3,102,000, the value being 4.3 dwt.

The company's South African subsidiary, which is under the technical management of the Anglo-Transvaal Consolidated Investment Co., has continued to earn satisfactory profits and in the Orange Free State has options over seven farms totalling 3,017 morgen in the Ventersburg area, approximately 2¼ miles north of Farm Harmony No. 222. In all, seven boreholes have been sunk jointly with other companies holding adjacent farms, the results of which, as the chairman pointed out at the last meeting of the parent company, are encouraging and clearly indicate that farms Welgegund, Mooiveld and Helpmekaar are underlain by the same reef horizon which in the Orange Free State has proved to be of economic importance.

### AUSTRALIAN INTERESTS

In Australia and New Zealand, interests and participations are held in several undertakings including the Wiluna Gold Corporation Ltd., Gold Fields Australian Development Co. Ltd., Golden Horse Shoe (New) Ltd., Blackwater Mines Ltd. and the Consolidated Gold Fields of New Zealand Ltd.

The Wiluna Corporation's interests are vested in its Australian subsidiary—the Wiluna Gold Mines Ltd.—which has now ceased mining operations. The latter company held a 75 per cent interest in an option granted by the Mount Charlotte (Kalgoorlie) Gold Mines Ltd. over their property. Unfortunately the results of exploratory work in conjunction with the generally difficult conditions obtaining in Western Australia did not justify the exercising of the option and accordingly it has been abandoned. In consequence, the Wiluna Gold Mines is being placed in voluntary liquidation. Following this, the Wiluna Gold Corporation itself which, of course, is the parent company, will also liquidate.

The Gold Fields Australian Development Co.'s main interest now is in the Mount Ida Gold Mines, the ownership of which was transferred during 1949 by the Gold Fields Australian to its wholly owned subsidiary, the Moonlight Wiluna Gold Mines Ltd. An intensive construction programme has been undertaken in order to equip this property with a new power plant and additional milling plant capable of handling about 25,000 tons a year. Probable ore at December 31, 1949, was estimated to amount to 123,700 tons averaging 9.37 dwt. per ton. Gold Fields Australian also holds, through the Moonlight Wiluna Gold Mines, a 33⅓ per cent interest in Porphyry (1939) Gold Mines. The accounts of Gold Fields Australian for 1949 showed a loss for the year of £2,523, which increased the debit balance on Profit and Loss Account to £24,142.

The Golden Horse Shoe (New) continues with its treatment of tailings dumps. During 1949 it was engaged in dealing with the large tonnage contained in Boulder Perseverance No. 2 Dump on a profit sharing basis with that company, and it is now investigating other dumps located in the vicinity of its plant. Out of its available balance of £8,466 last year, another distribution of 2d. per unit of stock was made equivalent to 8⅓ per cent.

### BLACKWATER MINES

For many years H. E. Proprietary has had an interest in the Consolidated Gold Fields of New Zealand, which company's chief asset is its large interest in the Blackwater Mines, situated in the Westland mining district of New Zealand. In its pre-devaluation struggle against an onerous gold export duty and high working costs, Blackwater incurred an indebtedness of £40,000, and with a view to liquidating this, it reconstructed its capital towards the end of 1950. Twelve shillings per share was written off each of its £1 shares which were then sub-divided into shares of 2s. each. Additional capital was raised by the issue of £50,000 4 per cent Five-Year Convertible Notes, £25,000 of which were offered for subscription at par to members of the company and of the Consolidated Gold Fields of New Zealand; the balance being subscribed by the H. E. Proprietary Ltd. The notes will be redeemable at par on December 31, 1955, or convertible at any time before that date at the noteholders' option into fully paid shares at par. A new lease of life has thus been given to this old gold producer. Urgent development work is being undertaken with the sinking of the north shaft to the 17th level horizon. Work has opened up some good runs of ore on the lowest level (No. 16) and, provided there is no further undue increase in working costs, there appears to be solid grounds for taking an encouraging view of the future.

During 1949, Blackwater made a profit of £1,257, which was eliminated by the provision of £3,000 for depreciation. 22,115 tons of ore were crushed, yielding 9,540 oz. gold. Operations were restricted through financial stringency and limited labour and the mill was able to deal with only 2,000 tons monthly against a capacity of 5,000 tons. Ore reserves at December 31, 1949, were estimated at 80,082 tons of 9.11 dwt.

### CANADIAN MINING: INDUSTRIALS

The company's Canadian holding in Anglo-Huronian Ltd. is an interesting one. This undertaking which has investment assets, apart from mining claims, of about $14 per share, holds diversified assets, but its most important investment is in the Kerr Addison Mine, a leading gold producer which is benefiting from the expansion of its treatment plant. Proven ore reserves were estimated at the end of 1949 at 8,193,473 tons, having a grade of .2016 oz. per ton. Anglo-Huronian's net profit for the fiscal year ended July 31, 1950 amounted to $792,859 compared with $366,895. Two dividends were paid of 15c. and 25c. respectively, and the total amount distributed since the incorporation of the company now stands at $5,100,605.

The main industrial interests of the H. E. Proprietary comprise a holding of over 90 per cent in Moussec, the well-known British sparkling wine undertaking, and a 99 per cent holding in Metalion Ltd., which concern specializes in all forms of electro-plating and similar processes. Both of these companies enjoy a strong financial position and their earnings continue to be maintained at a satisfactory rate.

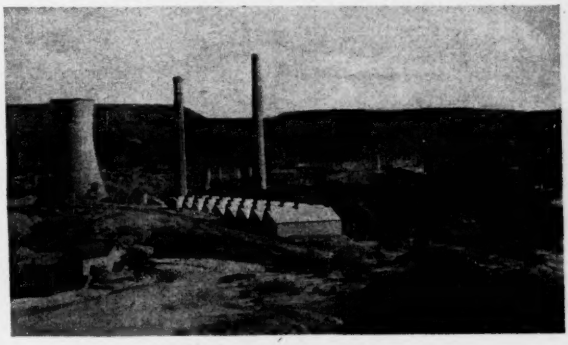
This brief review will suffice to indicate the sound financial position and scope of the H. E. Proprietary Ltd.

# Wankie Colliery Co.

THE WANKIE COLLIERY CO. occupies a position of unusual importance in that it underpins the whole of the industrial fabric of Southern and Northern Rhodesia and the adjoining territories. It is the sole source of supply of coal and metallurgical coke within 500 miles, and from its central location in the north-west corner of Southern Rhodesia in the Zambesi Valley it can conveniently supply the needs of Southern Rhodesia as well as the fuel requirements of Northern Rhodesia and a large part of the Belgian Congo.

The present Wankie Colliery Co., Ltd., was incorporated in 1923 but the history of this famous enterprise goes back to around 1893 when the Wankie coalfield was discovered. The original concession came under the administration of the British South Africa Co. who assigned the mining rights to the Mashonaland Agency. Before the turn of the century this concession of about 400 sq. miles had been tested, explored and at least five shallow shafts sunk with good results. In 1900-1901 fifteen more shallow shafts were put down and in 1901 the Mashonaland Agency's rights were assigned to the Wankie (Rhodesia) Coal, Railway & Exploration Co., which had been registered in 1899—the same year as the construction of a railway to the property had been started.

Important landmarks in the early history of the enterprise were the first marketing of its coal in 1903, and the arrival of the railway the following year. Output first exceeded 500,000 tons per annum in 1917. The company's second colliery was brought into production to the west of No. 1 Colliery in 1927 and resulted in output exceeding 1,000,000 tons in that year. In the year 1930, 1,131,079 tons of coal were produced, a record which was not broken until 1938 when an output of 1,155,973 tons was achieved. Coke production commenced in 1913, sales for that year being 19,853 tons. In 1950 coke sales amounted to over 100,000 tons a figure which had not been achieved since 1929.



**General view—No. 1 Colliery**

In 1949, the Southern Rhodesian Government proposed that the company should surrender the major portion of its original concession against the payment of compensation amounting to £350,000 (£150,000 payable on July 1, 1950, and the balance to be paid in annual instalments of £100,000 bearing interest at the rate of 3½ per cent per annum). Agreement on the proposal was reached with the result that the company will be left with an area to be delineated so as to contain an estimated 350,000,000 tons of saleable and extractable coal which, at an estimated output of 3,500,000 tons per annum, guaranteed the company a life of 100 years as from January 1, 1950. Should Wankie produce and sell a larger quantity than the 3,500,000 tons per annum, it is entitled to apply for and obtain additional mining leases in the ceded area on the same conditions as any other colliery company. It should be but a matter of time before this output figure will be exceeded, for if the industrial growth of Southern and Northern Rhodesia and of the adjoining territories is not to be stunted then output at Wankie can hardly be kept down to 3,500,000 tons per annum.

## GROWING DEMAND

Despite the increase in production from 1,748,955 tons in 1946 to 2,035,523 tons in 1949, demand has consistently outstripped supply. This worrying problem was tackled by a special committee appointed by the Southern Rhodesian Government to enquire into the anticipated demand for the company's products in the next few years. To put the collieries in a position to meet such demands, the necessary capital expenditure was estimated to be over £2,000,000. Accordingly, in April of last year the authorized capital of the company was doubled by the creation of 3,400,000 new shares of 10s. each, of which 3,293,750 shares were issued. Powell Duffryn subscribed for 800,000 of the new shares at 12s. 6d. and the balance of 2,493,750 shares was offered to shareholders at the same price in the ratio of three new for every four shares held.

Powell Duffryn's substantial investment in the fortunes of Wankie Colliery was followed by the news that this company, who were the largest colliery owners in the United Kingdom prior to the nationalization of the coal mining industry, had been appointed managers to the company for a minimum period of ten years as from May 1, 1950. Already in 1948 Powell Duffryn Technical Services had been appointed consulting engineers and purchasing agents to Wankie and this new move greatly strengthens the successful association of these two companies.

## DEVELOPMENT PROGRAMME

The development programme now in hand will, over a number of years, provide for the coal output to be raised to 5,000,000 tons per annum—a figure which will be achieved largely by introducing the latest mechanized methods underground. One of the most important and spectacular parts of the new programme will be the provision of a special water supply of almost 2,500,000 gallons of water a day from the Zambesi River, 30 miles away. This water supply is not only essential to support the increased output of coal and the carrying out of some of the technical operations, but also to provide water during the rainless months of the year for the whole community with its population of 1,000 Europeans and 15,000 natives. The modern power station which supplies both the collieries and the community is situated at No. 1 colliery, and considerable expansion of this plant is high up on the priority list as are provisions for the additional screening and washing plants needed.

The pillar and stall method of mining used at both of the collieries has been found very suitable for the seam worked, which is in the Karroo series and which varies in the workings from 5 ft. to over 30 ft. in thickness. The metallurgical coke is produced at No. 1 colliery in a plant with approximately 12,000 tons per month capacity. The principal uses of this good quality metallurgical coke are for copper smelting in the Belgian Congo, and for steel production at Que Que, Southern Rhodesia, and at the Rhodesia Broken Hill Development Co. in Northern Rhodesia. Associated with the coal measures in the vicinity of No. 2 colliery are clay, fireclay and shale beds from which excellent refractory products and bricks are made. Deposits of bauxite and magnesite are also worked by the company on its own claims in other parts of the Colony and in Portuguese East Africa.

Turning to the profit and loss account for the year ended August 31, 1950, gross revenue was shown at £1,293,805, the highest ever recorded in the company's history and a reflection of a corresponding record production of 2,280,102 tons. Expenses were higher though taxation, which called for £156,000 against £165,281, was lower and net profit worked out at £181,869 compared with last year's figure of £122,769. To the net figure was added £21,116 brought in, making £202,985 available against £146,835. The sum of £60,000, representing the approximate taxation benefit arising from the excess of the initial and annual allowances granted for the year on plant and machinery over the depreciation charged in the accounts, was placed to the newly created taxation equilization reserve. Dividend payments aggregated 7½ per cent, thereby breaking a run of ten consecutive years in which 5 per cent was paid, and absorbed a net amount of £102,545. The balance of £40,440 was carried forward compared with £21,116 in 1949.

During the current year the monthly saleable output is equivalent to an annual total of about 2,400,000 tons which compares with 2,142,354 tons for the year ended August 31, 1950, which was itself an advance of over 200,000 tons on the 1949 figure and over 1,000,000 tons greater than the figure for 1939. As Mr. Robert Foot said at the last annual meeting "the curve of increase is progressively upwards."

# Henderson's Transvaal Estates Ltd.

ALTHOUGH the original Henderson's Transvaal Estates Ltd., goes back over fifty years, the present company dates from 1912. It was formed for similar purposes to those of its predecessor, but has expanded its interests and taken advantage of opportunities for enlarging its scope. It derives the major portion of its income from coal mining, the subsidiaries being Tweefontein United Collieries, Henderson Consolidated Corporation, Mineral Holdings and Tweefontein Colliery Ltd.

## CEMENT INTERESTS

In addition to its mineral interests, the company has ventured profitably into the industrial sphere and become interested in White's South African Cement Co. The prescience shown in taking up this asset has been well rewarded. White's has become a dividend payer and with the big call for cement has extended production capacity and built a large modern factory at Lichtenburg in the Transvaal. Production from it is well under way, and in addition to the output of about 130,000 tons from the original factory, the new works produced approximately 200,000 tons of cement during the financial year ended November 30, 1950. The demand for cement continues to exceed the supply and the sale of the whole of the tonnage produced is ensured.

## MINERAL HOLDINGS

A wholly-owned subsidiary company—Mineral Holdings—formed many years ago, has functioned to the advantage of the parent company. It owns freehold farms and mineral rights in the Transvaal, Swaziland, and the Orange Free State. Potentially valuable properties have been secured, on which a search for metals—chrome ore, manganese, asbestos, etc.—has been going on. Careful investigation has indicated the existence of asbestos and prospecting agreements have been entered into in respect of certain properties in the Transvaal. In one case examination has proved the existence of an asbestos deposit and work is proceeding to prove to what extent that deposit exists in payable quantities.

Work is also in progress on the company's Havelock concession in Swaziland, where previous prospecting showed that the geological formation on certain parts is similar to that found on the small portion of the property sold to a leading British undertaking some twenty years ago.

In view of the existing demand for asbestos, a geophysical survey was carried out and resulted in a favourable report. Negotiations were consequently instituted resulting in the formation of a syndicate, the object of which is to proceed with the exploration of the whole of the concession.

The mineral rights on farm Vyrheid No. 779, situated near the town of Messina and adjoining the property of the big copper company—Messina (Transvaal)—also promise to become of value. As a result of a geophysical survey, undertaken through the agency of Mineral Holdings by the well-known expert, Mr. Oscar Weiss, a drilling programme is being undertaken. Results so far indicate that payable copper ore exists but further work must be done before it is possible to know to what extent the ore occurs in payable quantities.

## TWEEFONTEIN'S GOOD YEAR

The subsidiary through which the company holds a very large interest in South African coal—Tweefontein United Collieries—has well maintained its position amongst the leading producers. For the year 1950, net profit, after allowing for taxation, was £123,555. Dividends were maintained at 17½ per cent on the Ordinary share capital and 10 per cent on the Preference. For the year ended December 31, 1950, sales of coal totalled 1,344,804 tons. The reduction as in the previous year, was due primarily to an acute shortage of railway trucks. It is disappointing that there has been little improvement in this direction, but general trading conditions continue to be satisfactory with a well maintained demand for all classes of coal.

The export trade through Lourenco Marques has continued to hold out great possibilities for the future.

While revenue from coal sales is being well maintained, the company, like all others, has to contend with a constant and persistent rise in working costs. As an indication of the trend in this direction, coal-cutting costs alone have risen more than 3s. per cwt. in the last 12 months or so—the rise being mainly due to increases in wages for both European and African staff. An application to the price controller for permission to increase the prices of coal for internal consumption was disallowed; hence the extra costs have had to be borne entirely by the company, so far as home consumption is concerned. Fortunately permission was granted to increase the price of coal for shipment which has, to some extent offset the rising cost of production. There is, however, a limit to which this can take place on account of foreign competition, though it can be mentioned that the South African coal industry produces at remarkably low costs as compared with British coal—or indeed many of the continental countries of Europe. This fact, coupled with the good quality of the product enables it not only to maintain its markets abroad but to widen them.

## TRADING RESULTS

The Statement of Accounts of Henderson's Transvaal to March 31, 1950, disclosed a very strong financial position. The market value of the quoted investments showed a very small depreciation on the book value but the estimated value of the unquoted securities held was substantially in excess of the book value. The Reserve for Depreciation of Investment was £100,000.

The consolidated profit and loss account for the year to March 31, 1950, showed that coal mining contributed £183,419 to the company's total revenue of £223,121—the balance being largely income from investments. After meeting London and South African administration expenses, providing £20,000 for depreciation of coal mining assets and £69,821 for taxation, the net profit of the group amounted to £84,678, of which £70,653 accrued to the parent company and £14,025 to the minority shareholders in the subsidiaries.

After placing £28,424 to General Reserve and £3,987 to other Reserves, the parent company was able to pay 15 per cent for the fourth successive year. This left the group carry forward slightly lower at £153,188.

The consolidated balance sheet showed total assets of £1,886,517. Coal mining and associated items appear at £617,571 and mineral rights, £19,168. Quoted investments with a book value of £526,937, had a market value of £537,243, but against this there is an investment reserve of £100,000. Unquoted securities with a book value of £268,529, are valued at £325,000. Current Assets totalled £454,312. Current liabilities of the group, including taxation, and the parent company's dividend, totalled £198,539.

As these figures show, the group continues to be in a very sound liquid position, while total earnings have again amply covered the 15 per cent dividend distribution on the parent company's 4s. stock units.

It is interesting to note that dividends distributed by Henderson's Transvaal Estates since 1932 amount to no less than 208 per cent on the issued capital of the company and that since that date the general reserve has been increased from nil to £341,500. At the same time it has long been the policy of the group to conserve and strengthen its liquid resources, which to-day stand at a net surplus of £783,000 as compared with an issued capital of £563,697. The present position of the company is thus a very strong one and its future may be regarded with confidence.

# East Rand Consolidated Ltd.

THE principal interests of this mining finance house lie in the Far Eastern Rand and in the Orange Free State, although its investments now cover a broader field including Rhodesia, West Africa and Trinidad. In the Far Eastern Rand its preponderating interests are in Wit Nigel, Spaarwater and West Vlakfontein. Of these Wit Nigel and West Vlakfontein show the best signs of becoming valuable as time goes on, more especially if the coming years see the realization of the theory put forward some time ago that the whole of this Far Eastern section, where the properties of these companies are situated, may be underlain by the Witwatersrand series and contain the line of strike known to exist between certain widely-spread mines in the area.

New evidence occurs from time to time supporting this theory and towards the end of last year the Withok Proprietary announced that a borehole on its Eastern Rand property cut the Main reef at 7,161 ft. assaying 45.4 dwt. over 3.9 in. or 177 in.-dwt. The value of the strike was not very high but the depth was encouraging in relation to the indications from adjoining properties. The narrowness of the reef conforms with that of the rich Nigel shoots being worked in the famous Sub Nigel mine and also in Vlakfontein. This drilling result naturally again revived the theory about the shoots believed to run across the Eastern Rand basin from the south-eastern sub-outcrop to Van Dyk and East Rand Proprietary. While it is unwise to build up too many hopes on slender evidence, the prospects for West Vlakfontein and other mines are definitely enhanced.

## ORANGE FREE STATE

At the beginning of last year East Rand Consolidated had mineral rights under option in the O.F.S. amounting to 21,974 morgen. Amongst its more promising prospects in this field is a block of farms immediately west of the area belonging to the General Mining's subsidiary—"Geoffries"—which is positioned to the north-west of Odendaalsrus. It was on the farm Spes Bona 921 in this Geoffries block that the T.V.3 borehole recently struck values as high as 57.2 dwt. over 72 in. at 5,470 ft., this borehole being within about a mile and a half of the E.R.C. block.

Drilling operations have been carried out jointly with other companies and, as a result of this, one of the company's more recent ventures has been the acquisition, jointly with the Anglo-Rand Mining and Finance Corporation, of mineral options over an area of approximately 6,553 morgen in the Bothaville District. This new ground is situated mostly in the vicinity of Viljoenskroon, a few miles east of farm Niekerkstrust No. 298, on which a borehole is being drilled under the direction of Central Mining Free State Areas Ltd.

On the Bloemfontein block 3 boreholes have now been sunk intersecting the coal measures at shallow depth. These boreholes were W.B.1, W.B.2, and B.G.1, while borehole G.G.1 also intersected the upper coal seam. This with other drilling results has evoked the belief that there are sufficient coal-bearing seams to justify a colliery which, in due course, could supply the coal requirements of the O.F.S.

The company has recently acquired a 33⅓ per cent interest in further options over 4,407 morgen to the north-west of Odendaalsrus, known as the Justi Block, which adjoins ground at present held by the company and by "Geoffries" and Wit Extensions. Investigation of this area has commenced.

Work also is proceeding on other farms and boreholes have been put down jointly with "Geoffries", Eastern Rand Extensions, Free State Development and New Witwatersrand Gold Exploration.

Although the activities of East Rand Consolidated were as progressive as usual, financial results during the year ended December 31, 1949, were disappointing. Income from dividends and interest amounted to £6,394, while farm rents and sundry revenue brought in £984. There was a loss on sale of investments and property and the total loss for the year amounted to £59,047.

Investments which stand in the balance sheet at £1,440,405, include shareholdings in Ariston, Falcon Mines, G. C. Selection, Rhodesian Corporation, Spaarwater, West Vlakfontein, Wit Nigel and a number of other companies.

## WITWATERSRAND NIGEL LTD.

The benefits derived from the increase in the price of gold have been reflected in the results of the Wit Nigel, which is working a large property on the south-eastern corner of the Rand. The additional claims which it acquired some years ago from E.R.C. were more recently added to by the purchase of a surface area on farm Maraisdrift.

Development work is proceeding with satisfactory results. For the year to June 30, 1950, the footage accomplished amounted to 17,285 ft., which was in excess of that for the previous year. Of the 12,125 ft. sampled, 29.5 per cent proved payable averaging 17.7 dwt. About half the work done was on the Poortje section which, so far, has justified hopes entertained of it, as the payable footage here last year gave a pay ratio of 19.6 per cent and averaged 14.5 dwt.

For the third year in succession the ore reserves were again built up and at June 30, 1950, stood at 628,000 tons, with a value of 4.5 dwt. over a stoping width of 37 in. This showed an increase of 50,000 tons over the previous year.

A comparison of operations for the past two years shows:

| | 1948/1949 | 1949/1950 |
|---|---|---|
| Tons milled..... | 114,000 | 116,000 |
| Yield per ton, dwt..... | 5.607 | 5.345 |
| Working costs per ton ..... (inc. cost of development) | 55s. 1d. | 60s. 5d. |
| Working profit ..... | £37,290 (loss) | £24,671 (profit) |
| Capital expenditure ..... | £86,729 | £18,632 |

## SPAARWATER GOLD MINING CO. LTD.

The area over which the Spaarwater Gold Mining Co. has mining rights comprises 5,012 claims on farms Droogebult No. 12, Noycedale No. 11 and Spaarwater No. 9 in the Heidelburg district of the Transvaal. This well positioned property offers the hope that rich shoots will be found, similar to those of its neighbouring mines, and arrangements exist with Sub Nigel whereby that company carried out initial development and advanced its haulage ways beyond the boundary of the two mines into Spaarwater.

Operations were held up during the war but a re-start was made after the termination of hostilities and development resumed. Encouraging results, especially prior to the war, influenced the decision to re-open the mine and erect a treatment plant of 10,000 tons per month capacity. Milling commenced towards the end of 1947. Teething troubles were overcome and operations, if not yet profitable, are showing signs of improvement.

Parallel shoots to those in the Sub Nigel mine have not been found as was hoped, but work in connection with the exploration of the mine is progressing; haulages have been advanced and lateral development undertaken.

Development footage carried out last year totalled 20,898 ft. and of the 15,500 ft. sampled, 3,390 ft., or 21.9 per cent proved payable with an average value of 7.4 dwt. Both the pay ratio and value were lower than previously and as a result of the low percentage payability and the ore developed being insufficient to replace that mined, there was a decrease in ore reserves, the tonnage of which is now 199,000 of 5.8 dwt.

During 1950 the mill dealt with the highest tonnage so far—124,100. It resulted in a production of 30,283 oz. of gold, the yield per ton being 4.88 dwt. Revenue was £382,397, while mining and milling costs were £247,375. The excess of revenue over costs was the best so far, at £135,022. Development costs, however, called for £145,870 and the 12 months working resulted in a loss of £10,848 (against £13,121 the previous year). This amount together with the previous debit balance, increased the accumulated loss to date to £118,648.

## WEST VLAKFONTEIN GOLD MINING CO. LTD.

As its name implies, West Vlakfontein lies to the west of the Vlakfontein Gold Mining Co.—the successful producer of the Gold Fields group. The Consulting Engineer to the Gold Fields also acts as technical adviser to West Vlakfontein and it was on his recommendation that a programme of diamond drilling was initiated in place of a continuation of mining work underground, which had yielded disappointing results on both the Main Reef and the Kimberley Reef horizons in the Eastern section. Consequently, in order to give the property a comprehensive test, boreholes are being sunk on the western half of the mining area

The two particular holes on which work is being concentrated are W.V.3 and W.V.4. The former was deflected and re-drilled in order to correct excessive deviation from the vertical. It has been continued to a depth of 5,390 ft. and intersected the May Reef and Lower May Reef, both disclosing gold content, at depths of 4,934 ft. and 4,956 ft. respectively! At 5,279 ft. the borehole entered the Kimberley Shales and drilling is being continued.

The W.V.4 borehole is situated approximately 9,000 ft. north-west of W.V.3. It was started in the middle of 1950 and at the end of the year had attained a depth of 4,546 ft. Sediments of the Karoo System were encountered to a depth of 161 ft. and from that depth to 591 ft. the borehole traversed the Dolomite Series of the Transvaal System. Quartzites of the Black Reef Series were intersected between depths of 591 ft. and 601 ft. and at the latter depth the borehole entered the lavas of the Ventersdrop system. At 3,294 ft. the borehole entered the Kimberley-Elsburg Series of the Upper Witwatersrand System and at 3,553 ft. a dolerite dyke was encountered, which was being drilled through.

It is too early to assess the result of this drilling, but it seems evident, from results so far obtained, that it will give valuable information.

Additional to the company's own results, those obtained on the property of Withok Proprietary, adjoining West Vlakfontein, are of significance. Intersection has been made there of the Main Reef at a depth of 7,161 ft., giving a value of 45.4 dwt. over a width of 3.9 in., while a deflection gave 29.5 dwt. over 6 3 in.

# Rhodesian Corporation Ltd.

THE Rhodesian Corporation, which was registered in 1924, has a variety of interests, centred mainly in Southern Rhodesia where opportunities have arisen for participating in gold and base metal mines, as well as in agricultural and industrial enterprises.

The Corporation's mineral holdings in Southern Rhodesia include the Fred and Redwing Gold Mines, and other claims. The Corporation also has a half interest with Globe & Phoenix Gold Mining in the John Bull and the Phoenix West Parallel blocks of claims, together with shareholdings in South and West African mining companies, and interests in chrome and asbestos claims in Umvukwe, Rhodesia. Some years ago the Corporation sold to Falcon Mines, Ltd. the gold mining claims which comprise the Turkois Mine together with a half interest in the Dalny group of mines, and as a result has acquired a very large shareholding in Falcon Mines.

The Corporation owns 43,487 acres of land in Southern Rhodesia, part of which is devoted to tobacco growing and to general agriculture and livestock and part to real estate. For many years it has been cultivating tobacco and the acreage planted has increased with the growth of the industry. The Corporation's 1950 crop yielded 316,827 lb., which realized £55,279, and resulted in a profit of £26,289 compared with £14,939 in 1949.

The Corporation also derives income from land sales and estates and last year disposed of 70,775 acres at a profit of £28,753. It retains potentially valuable areas adjoining the municipal boundaries of Bulawayo and Salisbury. It has the Willsgrove Estates and the Hatfield township where there has been a keen demand for plots.

Amongst its commercial interests is that connected with the Rhodesian Brick and Potteries, Co., Ltd., which has works at Bulawayo and is proceeding with the erection of works at Salisbury.

The Fred Mine has been worked for many years but has now practically reached the end of its life, and it has become necessary to write off the Corporation's interest in the property.

A mine which promises some recompense for the loss of the Fred Mine is the Redwing, situated some two miles away, development to date having proved 39,400 tons, value 4.3 dwt. A trial crushing of 860 tons of development ore were treated at the Fred mine plant, producing 193 oz., or a yield of 4.5 dwt. per ton.

The company is to receive vendor and subscription rights in any company formed to operate the Pickstone Mine from which the latest reports show an estimated ore reserve of 52,000 tons of a value of 6.9 dwt.

### STRONG FINANCIAL POSITION

The Directors have recently published their Report and Accounts for the year ended July 31, 1950, which show a profit of £32,632. With the balance brought forward from 1949, the balance available is £85,779, the whole of which has been allocated as to £81,342 for provision against depreciation of investments, and £4,437 for taxation.

The company is consolidating its position as a leader in Southern Rhodesia by active participation in income producing industrial and mining ventures. The chairman reports that its cash position has been very considerably strengthened since the close of the financial year and the company is well able to meet all financial requirements.

### CAPITAL ADJUSTMENT SCHEME

The Corporation's consulting engineer has, at the Board's request, submitted a report on its mining interests and the Board has reviewed the position of the whole of the Corporation's assets. After detailed scrutiny, it is considered that the point had been reached where these should be written down. Proposals are, therefore, being submitted to stockholders to reduce the capital to £977,778 by writing off the sum of 1s. 8d. from each of the existing 5s. shares, reducing them to a nominal value of 3s. 4d. each. If the scheme is passed and approved by the Court the authorized capital will be £1,511,110, of which £533,332 will be unissued.

# Falcon Mines Ltd.

SPECIAL interest attaches to the Falcon Mines in which Rhodesian Corporation has a very large shareholding and which promises to become an exceedingly valuable asset. Excellent progress is being made by the company.

The properties consist of groups of gold mining claims in Southern Rhodesia, plus the M'Tuga copper claims in Northern Rhodesia. Production operations at the present time are confined to the Sunace and Bay Horse Mines, but it is with the Dalny group of claims that the future of the company rests.

The Sunace and Bay Horse are working at useful profit, the working surplus for the financial year to September 30, 1950, amounting to £52,066, of which the Sunace Mine contributed £45,379. Last year the 23,950 tons milled from Sunace yielded 7,736 oz. and the 9,020 tons from Bay Horse 1,819 oz., an average of better than 6 dwt. per ton for the two mines.

The ore reserve position of both mines is reasonably satisfactory, the 68,000 tons, value 5.8 dwt. at Sunace being equivalent to over two years' mill supply at current rate of operation, and the 22,300 tons value 5.4 dwt. at Bay Horse, being about the same. An active prospecting and development programme is being carried out on both mines and the outlook gives much promise, especially at the post-devaluation price for gold. An increase in milling capacity from 2,000 to 3,000 tons per month is scheduled for the Sunace Mine during 1951, subject to the supply of labour.

A pleasant surprise was given to shareholders this year by the announcement that at the Sunace property a substantial area underground had been demarcated where the reef contains appreciable quantities of scheelite—a tungsten ore. Additional plant has already been installed for recovery and concentration of this valuable mineral from current ore.

Production of scheelite concentrates started towards the end of March. Additional revenue from this source will be brought into the account as and when the concentrates are realized.

It was the profits from Sunace and Bay Horse which enabled the company to pay a 5 per cent dividend from earnings of nearly 10 per cent in 1948. Results have subsequently been substantially better but the company decided to conserve its resources and has refrained from paying another dividend. The reason for this policy is the necessity to provide finance to equip the Dalny Mine, on which confident hopes are reposed for the future.

The Dalny group of mines was acquired just after the end of the war. They consist of 666 gold mining claims in the Hartley district of Southern Rhodesia and work has been concentrated on the Dalny section with secondary work on the Turkois. A considerable amount of shaft sinking has been done and the main shaft is now down to the eighth level or 872 ft. deep. Ore reserves at September 30, 1950, amounted to 455,000 tons or an increase on the previous year's figure of 114,000 tons, the value being unchanged at 4.2 dwt. over 103 in.

Since the end of the last financial year, developments have shown up well. Lateral extensions to the ore body have been proved on the 3, 4, 6, 7 and 8 levels, and on the last-named on the first 265 ft. of driving payability of 85 per cent has been obtained with an average of 4.9 dwt. over 82 in.

The erection of a small milling plant to treat the ore from development has been completed and has been milling 2,500 tons monthly since January. Orders for the main reduction plant with an initial milling capacity of 12,000 tons of ore monthly have been placed and a large proportion of this plant has been delivered and erection is proceeding. Subject to delays in delivery, which might arise, milling is expected to begin early next year.

In order to carry the Dalny programme into effect, the company issued 778,119 new 5s. shares last year at 7s. per share in the proportion of three-for-four. This offer brought the issued capital up to £453,903 and provided new money amounting to £272,342, which, with the profits from the Sunace and Bay Horse Mine in the interim should be sufficient for the purpose.

The company's techical advisers consider that with gold at its present price, the Dalny Mine should become a good payable proposition.

Falcon Mines income for the year ended September 30, 1950, amounted to £61,027. After providing overheads, the net profit was £51,764. An amount of £50,000 was placed to general reserve and a further £25,000 written off shareholdings, reducing the book value to £22,242. These allocations reduced the carry forward to £63,537. Cash holdings figured in the balance sheet at £253,246.


# RUBBER IN MINING


*"Rubber in Mining," which is freely illustrated with photographs and diagrams, will gladly be sent free of charge to all interested.*

MINING ENGINEERS are well aware of the uses of rubber as an engineering material, and its applications in exploration and rock breaking, in transport and in the treatment plant. They will, therefore, be interested to learn that these and other uses of rubber in mining have been embodied in a new publication by A. V. Paull and J. Galloway entitled "RUBBER IN MINING."

In their preface the authors state : "We have treated the subject from the point of view of the practising engineer and have concentrated on applications which tend to cut mining costs. The answer to mining costs is increased mechanisation, and it is under just these circumstances that rubber becomes indispensable."

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# London & Rhodesian Mining & Land Co. Ltd.

THE title of this company is a fair reflection of the nature of its interests. It is engaged in mining, both directly and indirectly; it has agricultural interests in Southern Rhodesia and carries on ranching and develops real estate. It has also a portfolio of investments, principally in gold mining companies, from which it receives income by way of dividends and share dealings.

For the year ended June 30, 1950, the consolidated income of the company and its subsidiaries was considerably higher than that for the previous twelvemonth, amounting to £233,559 against £153,533. The accounts showed that the company did altogether better than in 1948-49, the influences of devaluation being particularly evident. Profit on realization of investments amounted to £4,075 against £4,418; there was a substantial rise in mining revenues which figured out at £40,416 against £22,951, and a profit from estate sales of £31,841. Other sources of income showed up favourably for the company; dividends amounted to £37,665 compared with £31,667, rents brought in £5,798 (£5,372), and ranching resulted in an income of £29,734 or £2,240 more than for the previous year. There was likewise an additional amount received by way of sundry revenue of £34,030. Taxation called for a larger sum and, after adjustment in respect of previous years, amounted to £66,845. The net revenue was considerably higher at £93,689, which compared with £32,916 the previous year. As for many years past, the dividend was maintained at 5 per cent, which called for £26,125, and after placing a substantially increased amount of £61,787 to General Reserve, the balance carried forward amounted to £47,831.

## INVESTMENT INTERESTS

The company holds substantial interests in many well-known undertakings including Henderson's Transvaal Estates, Cam and Motor Gold Mining and Rezende Mines. The former undertaking controls Hendersons Consolidated, Tweefontein United Collieries, Mineral Holdings and Tweefontein Colliery. The group accounts for the year to March 31, 1950, disclosed a profit of £70,653, while Henderson's Transvaal showed a profit after taxation of £50,342, and maintained its 15 per cent dividend.

Cam and Motor earned a net profit for the year to June 30, 1950, of £244,488 compared with £197,069 in the previous year and paid a dividend of 30 per cent compared with 18 per cent. An improvement was also shown in milling operations, 246,500 tons being milled for a working profit of 22s. 3d. per tons as compared with 221,300 tons and a working profit of 20s. 7d. per ton. Ore reserves at the end of the financial year stood at 1,555,800 tons of an average value of 6.9 dwt. Provided that the labour supply can be maintained, earnings in the current year should show further improvement.

The Rezende Mines made a better showing for the year to December 31, 1949, with a profit of £607 against a loss previously of £16. The mine still has a substantial reserve of ore in both the Rezende and the West Mine; tonnage in the former amounting to 272,800 of 3.2 dwt.

## MINING INTERESTS

The direct mining interests of the company are centred in the Vubachikwe mine and the Connaught mine, both of which are developing well. The former crushed 35,700 tons during the year and made a profit of £4,851. Ore reserves at June 30, 1950 totalled 80,100 tons of 5.7 dwt. The Connaught mine dealt with 8,980 tons and made a profit of £13,229. Ore reserves amount to 19,650 tons, having an average value of 8.1 dwt.

Another interesting mining participation is a 50 per cent interest in the Pickstone mine. Work on the property has been energetically pursued; and a headgear and compressor plant installed with other necessary machinery. The Burnett main shaft has been sunk to the horizon of the fourth level, from which a crosscut has intersected the ore body, and a drive has opened up ore of 6.9 dwt. per ton. The third level has been driven on and the total strike of the ore body here, inclusive of the parallel lode is 1,300 ft. assaying 9.5 dwt. At June 30, 1950, the estimated ore reserve was computed at 52,000 tons of 6.9 dwt. A second shaft, the Southwell shaft, has been sunk to the second level and provides both ventilation and facilities for handling ore from the development ends. The company also has an option over certain adjacent claims known as the Venning Claims.

## LAND HOLDINGS

The company's valuable land holdings now comprise 1,016,676 acres—after taking into account 30,878 acres sold last year at a profit. It also has 27 town stands and buildings situated in Salisbury, Bulawayo and other important developing centres in Southern Rhodesia. The net profit from rentals for 1949-50 amounted to £5,257.

It need hardly be emphasized that, with the higher valuations which have taken place throughout the world, the present-day value of land assets is very much in excess of the figure at which they stand in the company's accounts—£198,831. Consequently, a detailed survey is to be made in order to establish an up-to-date inventory on which to base future policy for each property. Close attention is being given to this matter and technical advice has been sought. It is intended to pursue a forward policy with regard to any of the company's land which is ripe for development, either by the company itself or by others who may be interested. Clearly with the big expansion going on in Rhodesia, the possibilities in this direction are considerable.

One of the company's directors, who is an expert on land and real estate matters, has gone out to Rhodesia and his knowledge and assistance will be of the greatest help in deciding future policy.

## RANCHING ACTIVITIES

Of the company's large land holding, 547,951 acres are represented by its ranches Wiltshire and Lochard. Revenue from this source during the year to June 30, 1950, was better and the profit of £29,734 showed an increase of £2,242 over the previous period. There was an improvement in the price realized for cattle and the average per head was £14 15s. as against £12 19s. the previous year.

The company's main ranching activities are carried on at the Wiltshire ranch comprising nearly 448,000 acres, where the cattle population amounts to some 16,000. The Lochard ranch is much smaller—100,000 acres with some 8,000 head of cattle.

Southern Rhodesia is liable to drought and during these periods, grazing for the cattle deteriorates. One of these severe droughts was experienced during the latter half of 1949 and as a consequence, cattle were lost, but fortunately through the sagacity and efforts of the ranch manager, the percentage was much smaller than that generally throughout the country.

All possible steps are being taken to improve the water supplies at the ranches. Boring has been resorted to and supplies of water found. At Lochard ranch a large dam has been constructed which will be of great help in conserving water during the rainy season.

No forecast of ranching prospects can safely be made but with the steps now being taken to ensure adequate water supply, the outlook is not unpromising. Increased mechanization is being envisaged, together with the capital expenditure which will be required to carry out the necessary improvements.

Although costs in Southern Rhodesia continue to rise and may cut into earnings from its mining and land ventures, the company's spread of interests is sufficiently wide to suggest that its position will be maintained. Moreover, the progress being made with the developing mines in which the company is interested, gives promise of an upward trend in revenue and profits in future years.

## COMPANY'S VENUE

Like other companies having to bear the burden of intolerable taxation, London and Rhodesian Mining has considered the matter of transferring control to Southern Rhodesia where so many of its interests are centred. The company's legal and taxation advisors have been consulted, but it is evident that the disadvantages of migration outweighed the advantages from the point of view of stockholders registered in the U.K. —who hold over 95 per cent of the capital. Annual meetings would have to be held in Rhodesia and thus shareholders would in practice be prevented from attending them and exercising that personal control over the company's affairs to which they are entitled. The quotation of the shares on the Stock Exchange might be affected but of major importance to the company is the London capital market and a migratory move would unavoidably result in the loss of these facilities, which have hitherto been of unbounded help.

Taxation on companies controlled in Southern Rhodesia is not so light as generally supposed. Furthermore, migration would make it impossible to maintain in London any organization for handling the company's portfolio of investments which, with those of the subsidiary—African Investment Trust—amount to nearly £700,000.

# Rosterman Gold Mining Ltd.

THE two most important gold belts in Kenya are those of Kakamega in the north and Migori in the south. It is in the northern region that the property of the Rosterman Gold Mines is situated. The area is a large one and skirts the banks of the River Isioka, while the company also owns an extensive prospecting licence on ground to the south side of the river. In this northern region gold occurs most commonly in quartz veins of varying thickness, the average worked so far being between 1 to 2 ft.

Rosterman has spent a great deal of money and time on its property since taking it over from the Tanami Gold Mining Syndicate in 1935 and has developed it into the most important producing mine in the northern region of the Colony. Operations progressed normally up to the start of the war when inevitably the company suffered the disruptions of a wartime economy. Labour became scarce, materials were in short supply and an upward trend in prices continued unchecked, while the price of gold remained static.

A great deal was done by the management to meet the situation but large blocks of low-grade ore in the mine had to be discarded and economies made in many directions. Fortunately the devaluation of sterling and the higher price for gold gave a better complexion to the outlook.

## OPERATIONS FOR 1950

Preliminary figures of the mine's working for 1950 indicate that results showed an improvement over those of the previous year. The mill dealt with 42,195 tons of ore, for a yield of approximately 12,758 oz. gold, valued at £158,507. Expenditure, which included development, amounted to £130,193 and the surplus worked out at £28,314. Capital expenditure which during the past few years has made a call on the company's resources, continued and an amount of £16,379 was spent in this direction. New rock drills have had to be bought with additions to the Compressor plant, while other items of plant have had to be obtained to supply the mine with the necessary underground implements and keep abreast of operations.

The footage of main development last year totalled 1,517 ft. During the period work was done on the No. 5 Footwall Reef and a winze 445 ft, West was continued to the random of the No. 23 level and the opening up of this level took place by driving East and West for 320 and 325 ft. respectively. A strong quartz vein was exposed which carried only low values.

On the No. 1 Footwall Reef, diamond drilling and crosscutting exposed a footwall branch which was developed. The South Drive 190 ft. west was commenced and advanced 45 ft. its values averaging 20.9 dwts. over 45 inches. The North Drive (opposite) was commenced and advanced 30 ft. in values averaging 5.3 dwts. over 20 inches.

Although the management hold out hopes for the mine, it is evident, from the intermittent values and the large amount of "dead" work which has to be done, that operations are very difficult. Notwithstanding untiring development efforts, luck has not favoured the company and the life of the mine would appear to be limited. The company is therefore looking round for additional sources of ore so that its surface plant may continue to be profitably utilized.

## ORE RESERVES

During the year 1949, for which the last accounts are available the tonnage crushed was 33,080, for a return of 12,309 f.oz. gold, as compared with 30,156 tons treated for a return of 14,116 oz. in 1948. Although less gold was won, gold sales realized £121,744 as against £121,753 in the previous year, the reason being that, of the year's production, 8,194 f.oz. were sold at the old price of gold and 4,114 f.oz. at the price now ruling. Had the company received the present price for its gold for the whole of the year's output, revenue would have increased by £31,036, which would have resulted in a profit instead of a loss of £13,116.

There was fortunately a drop in working costs which, including all development, were 74s. 3d. per ton of ore milled, compared with 77s. 9d. in 1948. Development costs were 8s. 5d. per ton milled compared with 17s. 8½d. per ton for the previous year. Development during the year added little ore to the reserves. They were however, increased by a reduction in the pay limit following on devaluation, and their last computation was 78,895 tons of an average value of 7.36 dwt. as against 62,170 tons of 9.32 dwt.

The accounts for 1949 showed the value of gold recovered less selling expenses at £120,510. Against this mine expenditure including development, shaft sinking and administration amounted to £108,784. London expenditure accounted for £3,955 and depreciation of plant, machinery, etc., for £7,373. The result was a loss on the year's working of £13,116. There was a small credit of £409 for insurance premiums refund, and with a debit balance of £42,586 brought forward from the previous year, the balance standing to the debit of Profit and Loss amounted to £55 293.

# British South Africa Co.

THE extraordinary history attached to the British South Africa Co., more familiarly known as the "Chartered" Company, from the time of its founding by Rhodes and its incorporation by Royal Charter in 1889 down through the 34 years of its administration of Northern and Southern Rhodesia, is too well known to recapitulate here in any detail. The same may be said of the outstanding events marking its progress during the last 20 years. The sale in 1933 to the Southern Rhodesian Government of its mineral rights over the Colony for £2,000,000 comes readily to mind as does the sale by the Rhodesia Railways Trust, of which Chartered controlled 80 per cent of the share capital, of the entire share capital of Rhodesia Railways Ltd. Of more recent date is the arrangement concluded with the Northern Rhodesian Government in August, 1949. This agreement stipulated that while the company was to retain its mineral rights over Northern Rhodesia until October 1, 1986, it was to pay to the Government during this 37-year period 20 per cent of its net royalty revenue, although this 20 per cent was to rank as an expense for tax purposes in Northern Rhodesia.

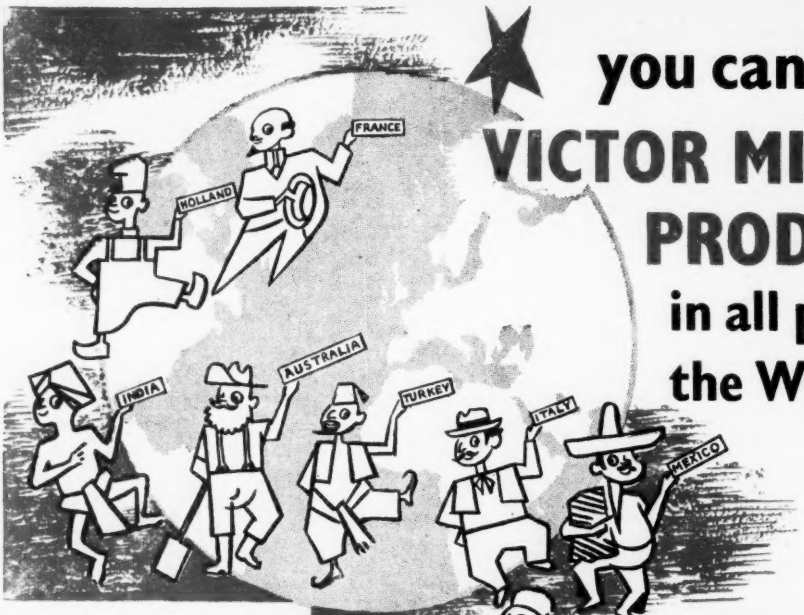
Despite the loss of all these substantial possessions the company's assets are still very impressive and at the date of the last directors' report, May 30, 1950, covering the year ended September 30, 1949, they comprised mineral rights throughout Northern Rhodesia, mineral rights covering approximately 16,000 sq. miles in Nyasaland, 50 per cent interest until April 1, 1964, in the net proceeds from land sales in North Western Rhodesia, citrus and other estates totalling over 110,000 acres in Southern Rhodesia, and controlling interest in both Rhodesia Railways Trust and Shabani Railway Co. In addition, the company has large interests in Wankie Colliery, in the Anglo American Corporation of South Africa, and in Rhodesian Anglo American. Through the latter it has important interests in the Northern Rhodesia Copper Mining Companies from which it receives royalties based on their production. Of importance is an interest in Rhodesian Alloys taken since the close of its financial year. This is a new company sponsored by Messrs. John Brown & Co., and will operate a metallurgical plant in Southern Rhodesia.

Results for the year ended September 30, 1949, compared with 1948, show that the group's gross profit increased to £3,321,558 against £2,835,494, an increase largely accounted for by the rise in investment income which totalled £714,513 against £547,420. Expenditure was also higher, due almost entirely to taxation liabilities which increased by £354,841 to £1,819,873. Consolidated net profit amounted to £1,479,155 and after making adjustments for sums accruing to, or retained by, a subsidiary company, net profit as per profit and loss account of the British South Africa Co. was £1,458,778 against £1,394,651 previously. To this net figure was added £1,586,819 making £3,045,597 available. A dividend payment of 33⅓ per cent less tax, absorbed £1,204,569, leaving the carry forward higher at £1,841,028 compared with £1,586,819 previously.

The consolidated accounts referred to here include the British South Africa Co. and its subsidiary, the Rhodesia Railways Trust, but does not include the accounts of the Shabani Railway Co. which are presented separately and show that for the year ended September 30, 1950, net profit amounted to £931. A dividend payment of 10 per cent absorbed a net amount of £2,750 leaving the carry forward reduced to £11,011 compared with £12,830 previously.

The close interest which the British South Africa Co. takes in the Northern Rhodesian copper mining industry could hardly be otherwise. The company benefits both directly and indirectly through its large shareholdings, and as recipients under agreements concluded with the companies by which it receives royalties in return for mining rights. These royalties are mainly derived from copper and are based on a sliding scale geared to the price of the metal. During the period under review the price of copper used for calculating the company's royalties was only £118.85 per ton whereas for the current year—the 12 months ended September 30, 1950—the average price must have been about £175 per ton. Similar increases in royalty revenue during this current year should also accrue from lead and zinc, the prices of which have advanced sharply from the £108.11 per ton for lead and £88.03 for zinc used in 1949. Notwithstanding the relatively low prices received per ton for the three metals, gross royalty revenues amounted to no less than £2,627,821 and current mineral revenue should be substantially better. However an assessment of Chartered's overall results is complicated by the fact that the Northern Rhodesian Government will for the first time be participating in mineral revenue to the extent of 20 per cent.

The report and accounts have not yet been published, but the dividend has been announced and is maintained at 33⅓ per cent, the same as for the period under review.

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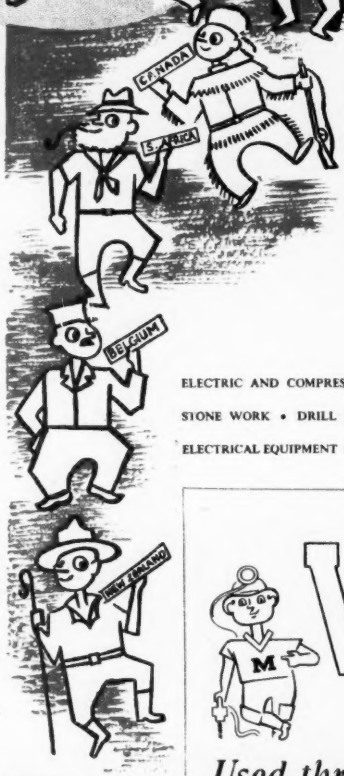


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# The Zambesia Exploring Co. Ltd.

THE Zambesia Exploring Co. is an old-established investment company whose interests lie in central and southern Africa. Founded in 1891 by the late Sir Robert Williams, Bart., its origins go back to Africa's pioneering days and one of the most outstanding projects in which it took part was the formation of Tanganyika Concessions in 1899.

The Zambesia Exploring Co. itself was formed to acquire various blocks of claims and land in Rhodesia, with town plots in Salisbury, Umtali and other towns, from Rhodes' Chartered Co. Several developing undertakings and other assets were acquired later but to-day its business is confined to its investment holdings. These have changed as a result of last year's capital reorganization of Tanganyika Concessions (referred to on the next page), and Zambesia Exploring now owns, in conjunction with a newly-formed and wholly-owned subsidiary, the Zambesia Investment Co. Ltd., 361,659 Tanganyika Preference 16s. shares and 485,176 Ordinary 10s. units. All the Preference and 216,995 of the Ordinary units have been transferred, as a fixed investment, to the Zambesia Investment Co. and these are valued in the balance sheet at £399,361.

Additionally, the company has an important group of Central and East African investments which, with similar holdings held by Tanganyika Concessions, have been transferred to a new Company—Tanganyika Holdings—in which Zambesia Exploring has a 50 per cent participation.

The Company continues to hold direct its other 268,181 Tanganyika ordinary units, together with other investments which have a balance sheet value of £465,600. Of this total, £456,145 was represented by quoted securities having a market value at December 31, 1950, of £656,348. Other current assets include cash at £216,765, while current liabilities figure at £200,123.

Total revenue for 1950 showed a large increase at £181,001 and the net profit, after tax and after providing for administration and other expenses rose to £78,533. The distribution was increased from 9 to 13 per cent (including 5 per cent bonus), and the balance carried forward (£81,931) represented another 9½ per cent on the issued capital of £865,333.

### TANGANYIKA HOLDINGS LIMITED

This new company was formed in 1950 for the purpose of taking over the Central and East African investments of both the Zambesia Exploring Co. and Tanganyika Concessions on the move of the latter company to Southern Rhodesia. The main assets of the company consist of holdings in Kentan Gold Areas Ltd., The Geita Gold Mining Co., the Rhodesia-Katanga Co. and Uruwira Minerals Ltd.

The future of Kentan Gold Areas, in which 509,675 shares are held, hinges on the Geita gold mine in the Mwanza district of Tanganyika. This now has ore reserves of 2,280,456 tons estimated at 3.8 dwt. per ton. During the year to June 30, 1950, the total tonnage milled was 174,748 yielding 30,524 oz. gold for an operating profit of £64,064. During 1951 it is expected to raise the tonnage milled to 1,000 tons per day.

The Rhodesia-Katanga Co. owns land, mineral and farming rights in Northern Rhodesia; also the Kansanshi mine, which is not at present in production.

Uruwira Minerals owns prospecting rights and a mixed metal —principally copper and lead—undertaking in the Kigoma district of Tanganyika which is not yet in production. Development has gone ahead and progress made towards blocking out sufficient tonnage to justify the finance and erection of a full-scale treatment plant. The consulting engineers associated with the well-known Patino Group, which are also interested in the property, have put forward proposals for bringing the mine to production, and, with a view to giving effect to these and to obtaining the necessary finance to complete development, it has been suggested that a low interest-bearing short term loan should be negotiated. Current development expenses are being covered by shipments of concentrates prepared in the pilot plant

# Tanganyika Concessions Ltd.

THE name of Tanganyika Concessions Ltd. evokes memories of Cecil Rhodes and the early days in South Central Africa. Founded by the late Sir Robert Williams, Bart., in 1899 the company took over land and mineral rights in Rhodesia from the Zambesia Exploring Co., which had originally obtained them from Rhodes' Chartered Co.

With a capital of £10,000,000 of which £5,676,036 has now been issued, Tanganyika Concessions Ltd. has acquired widely spread assets during its 50 years of existence. First came the important mineral discoveries in the Belgian Congo, where Sir Robert Williams had been granted a concession, which later resulted in the formation of the Union Minière du Haut Katanga in 1906 with Tanganyika Concessions holding an important interest. Later came the financing and construction of the Benguela Railway, an important route to South Central Africa, running through Angola to the west coast, which was opened to Katanga in 1931 and is now carrying an ever-expanding traffic. Through its recently-formed associate Tanganyika Holdings Ltd. it has interests in Northern Rhodesia, which include the Kansanshi Copper Mine, owned by the Rhodesia Katanga Co.; and in Tanganyika Territory, which include gold producing properties owned by the Geita Gold Mining Co. and a mixed-metal property owned by Uruwira Minerals, which has not yet reached the production stage.

"Tanks"—as the Market calls the undertaking—has been much in the news this last year or so. The shares have received prominence as the result of a sale by the British Treasury in the early part of 1950 to an Anglo-Belgian group of 1,667,961 Ordinary shares, 600,000 of which were subsequently acquired by American interests. These shares previously held by French nationals had been acquired from the French Government by the British Treasury in 1946 as part of an exchange transaction, and the manner of their recent disposal has done much to strengthen the company's necessary liaison with Belgium, and has opened the door to co-operation with other important concerns interested in the development of the African continent.

## CAPITAL RE-ORGANIZATION

The capital structure of the Company has for some time past presented difficulties, due to a potential conflict of interest between the Ordinary and Preference stockholders, the latter having had certain limited participating rights on an equal footing with the Ordinary Stockholders. In the course of last year these seemed likely to be brought to a head both by a possible need to raise fresh capital in the future and by the proposal to remove the control of the company to Southern Rhodesia, neither of which operations could be expected to work to the complete advantage of Preference Stockholders. Consequently, a capital reorganization scheme was carried through last October, which had the effect of extinguishing the participating rights of the Preference Stockholders by offering them one 16s. 8 per cent non participating Cumulative Redeemable Preference share plus 6s. of Ordinary capital for each £1 Preference share held. Following this operation it was decided, with Treasury consent, to transfer the company's domicile to Southern Rhodesia, and the move took place in November, 1950.

A "Tanks" U.K. Stockholders Committee has now been formed in London to provide a channel of communication between the Ordinary stockholders in the U.K. and the Board in Southern Rhodesia, and to enable them to be represented at meetings of the Company.

For the year ended July 31, 1950, Tanganyika Concessions made a profit before taxation of £1,015,055 (including £239,470 profit on redemption of Benguela Railway Co. Debentures transferred to Capital Reserve) against £863,244—a rise brought about chiefly by increased dividends and royalties from the Union Minière. Taxation on the higher profits was some £288,000 less at £186,563 after taking into account relief in respect of double taxation. At the same time £163,451 was written back in respect of tax provisions no longer required and relief from double taxation for previous years. The dividend of 10 per cent (same) on the Preference and 12 per cent (10 per cent) on the Ordinary stock absorbed £334,037; and the carry forward was raised from £215,680 to £564,116. The chief items comprising the company's revenue of £1,058,745 were £617,146 received as dividend from Union Minière, £178,238 royalty from Union Minière and £239,470 profit on redemption on Benguela Railway debentures.

The company's prospects, following its move to Southern Rhodesia, can be viewed with satisfaction. Tax must necessarily be subject to agreement with the authorities but savings in this respect, plus the probability that in due course the large interests in the Benguela Railway will become productive of higher income, offer a good prospect of higher earnings. Moreover, with copper at its present price, a good return from the Union Minière holding can be anticipated for the current year.

## UNION MINIERE DU HAUT KATANGA

Operational results achieved by the Union Minière have continued to give the utmost satisfaction. This Belgian Congo producer of copper, cobalt, zinc, cadmium, silver, gold and uranium, in which "Tanks" has a 14.5 per cent share interest with 20 per cent voting rights, was formed in October, 1906, and has had a fine record. The chairman's address at the general meeting in June of last year struck the customary note of cautious optimism. He pointed out that the Union Minière ranked among moderate cost producers, and was able to be a consistent dividend payer while providing for all necessary amortizations and also making a large contribution to the budget of the Belgian Congo. Dividends on the results for 1949 were again Fcs. 480 net per Part Sociale, which was paid out of an operating profit for the year, including income from dividends and interest, amounting to B.Fcs.1,747,814,086. An interim dividend of B.Fcs.400 has also been paid in respect of 1950.

The production of copper for 1949 amounted to 141,399 tonnes compared with 155,515 tonnes in the previous year. The decrease was due to shortage of hydro-electric power. Notwithstanding a decreased selling price for copper of 20.4c. per lb. in 1949, as against 22.3c. in 1948, the profit made was much the same as in the previous year. Production of cobalt totalled 4,403 tonnes. The deliveries of raw zinc concentrates amounted to 52,107 tonnes and of roasted zinc concentrates 42,731 tonnes. The production of cadmium amounted to 24,635 kg. and that of silver of 149,342 kg. including 44.5 kg. of gold and 3.3 kg. of palladium. Sales of uranium ores and concentrates, and of radium salts derived from them proceeded normally.

As a result of prospecting work carried out, the copper and cobalt reserves have increased, and it is noteworthy that tonnages developed during the last few years have been largely in excess of the tonnages actually extracted.

The programme of extension and equipment of the various works is proceeding according to plan. Concentrating plant and the electrolysis plant for copper and cobalt are being enlarged, and further items installed to increase the amount of cadmium and lead.

## TANGANYIKA HOLDINGS LTD.

When Tanganyika Concessions Ltd. moved to Southern Rhodesia in November, 1950, Tanganyika Holdings Ltd. was formed to take over the Northern Rhodesian and East African interests of the company which include participation in the Rhodesia-Katanga Co., with certain mining, mineral and land rights in Northern Rhodesia (including the Kansanshi mine which is not at present in production); Kentan Gold Areas which controls mining and prospecting companies in the Mwanza district of Tanganyika Territory, of which the Geita Gold Mining Co. is a gold producer; and Uruwira Minerals which owns prospecting rights and a mixed-metal mine in the Mpanda district of Tanganyika Territory, whose main product will be lead but which is still under development.

# Rhokana Corporation

THE events of recent years have thrown into relief the great importance of the Northern Rhodesia copper mines. The industry, which is an important dollar saver, continues to expand at a time when copper is in critically short supply. Thus, Great Britain derives a two-fold advantage from being the purchaser of the mines' outputs, while the economy of the Colony is also benefiting.

The initiative which has brought into being the four existing mining companies which constitute the so-called copper belt area, owes its inspiration to the Anglo American and Selection Trust groups, whose activities are dealt with elsewhere in this *Review*. These companies now produce about one-eighth of the world's copper and their production is increasing. The mines have remarkable characteristics; the ore bodies are of great thickness, varying from 20 ft. to 100 ft. or more; they permit easy and economical working, with the ore breaking in large sizes, and they are amongst the lowest cost copper producers in the world.

One of the most prominent—and successful—undertakings of the copper belt is the Rhokana Corporation which is controlled by Rhodesian Anglo American Ltd. Besides being itself a big copper producer, Rhokana also has a large interest in other undertakings in the field—in Mufulira Copper Mines, an established dividend-payer; and Nchanga Consolidated Copper Mines, which made a first and substantial distribution last year. Rhokana is also interested in Rhodesia Copper Refineries, and as a consequence of this span of assets, it is particularly well qualified to speak on all matters associated with the industry, so that the publication of the company's annual report and chairman's review, has come to be something of an event.

For the year ended June 30, 1950, the Rhokana Corporation's copper output amounted to 80,540 l.tons compared with 74,982 l.tons in the previous year. This was made up of 64,864 tons of electrolytic and 15,676 tons of blister, proportions which compare closely with those of the preceding year. Additionally, the smelter treated concentrates from Nchanga Consolidated, resulting in the production of a further 35,595 l.tons of blister and 3,993 l.tons of anode copper.

Thanks to an improvement in the grade of cobalt in ore, the production of cobalt alloy was considerably more than previously; amounting to 1,954 s.tons containing 739 s.tons of cobalt. In order to improve the percentage of recovery and to produce a product suitable for market without further treatment, it was decided some four years ago to erect an electrolytic cobalt refinery with a capacity to produce 1,500 s.tons of electrolytic cobalt metal per annum. Production is expected to start this year.

The revenue from metal sales again showed a substantial advance amounting to £10,597,893 (against £9,489,653), due both to larger output and higher price, while the total standing to the credit of the operating account, including stock of metal on hand and settled claims relating to earlier years, amounted to £12,768,647 compared with £10,832,455. Operating costs were in advance of those for the preceding year, but after allowing for depreciation, redemption, realization and outside refining charges there was a profit of £5,702,620 against £4,743,644 in the previous year. By reason of its dividend from Mufulira and a maiden dividend from Nchanga Consolidated Copper Mines, the net balance was increased to £6,687,165 contrasted with £5,425,175. There was an increase in taxation at £3,590,223, compared with £2,805,324, and the amount placed to general reserve was £1,400,000 as against £1,125,000. The dividend on the Ordinary stock for the year was increased from 100 per cent to 120 per cent and the balance carried forward was slightly reduced to £556,249 as compared with £560,270. The company's balance sheet shows fixed assets at £13,924,020—an increase of £696,378 on the year. Current assets rose to £11,554,284 compared with £10,407,517, and after allowing for current liabilities and reserves for income tax totalling £7,491,058 the net liquid assets increased by £202,583 to £4,070,727.

The good smelter and refinery output during the year, the highest ever recorded, was helped by increased deliveries of coal. But since the end of the financial year the fuel position has become worse necessitating a curtailment of production. Everything is being done to alleviate the position.

With the completion of the Rhodesia Copper Refineries' new electrolytic refinery, it is expected that almost the entire output during the current year will be electrolytic.

## MUFULIRA COPPER MINES

The Rhokana Corporation's interest in Mufulira Copper Mines amounts to 1,300,000 shares out of 4,888,874 issued, a figure at which it has remained for some years. A majority of the shares is held by the Rhodesian Selection Trust.

For the year to June 30, 1950, the company increased its output of blister copper to 77,048 l.tons, compared with 70,966 l.tons for the previous twelve-month. This was the highest output achieved since the war-time peak output of 85,523 l.tons in 1942/3. On this bigger production, costs per ton, including smelting and administration, were £54 19s. 6d. against £54 12s. 2d., while adding provision for replacements, the total costs were £64 1s. 8d. compared with £61 13s. 1d.

A larger tonnage of ore was dealt with at 3,134,493 tons compared with 2,973,935 tons for the previous twelve months. Since the close of the financial year there has had to be some curtailment of output due to lack of fuel. The construction by the company of an electrolytic refinery with an initial capacity of 36,000 tons per annum is going forward. Production should start during the first half of 1952.

The amount obtained for copper sales showed an increase of £144,530 to £8,762,398 and after meeting administration expenses and providing £700,000 for replacements and £2,570,563 for taxation, the net profit amounted to £1,606,172. After making a distribution of 8s. 6d. per share, as for the previous year, the forward balance was lower at £183,016.

Output of blister copper during the second six months of 1950 (since the end of the financial year) amounted to 42,618 l.tons compared with 38,349 l.tons in the corresponding period of 1949. The estimated profit for the period before tax was £3,796,000 compared with £1,723,000 in the second six months of 1949, due primarily to the rise in the price of copper.

The estimated tonnage of ore reserves at June 30, 1950 was 162,822,000 s.tons, containing 3.89 per cent copper, which at the current rate of milling is expected to be sufficient to last for more than 40 years.

## NCHANGA CONSOLIDATED COPPER MINES

During the year ended March 31, 1950, a further expansion in operations and increase of copper production took place at Nchanga Consolidated in which Rhokana holds a 30 per cent interest. It is the youngest of the group, having been formed in 1937, since when its productive capacity has steadily increased. Following the programme of expansion which aimed at a production of 64,000 l.tons of copper per annum by the end of last year, it was disclosed recently that output rate is now to be stepped up to 108,000 tons by the end of 1952. The cost is estimated at £5,700,000 and it is anticipated that the money may be raised by the issue of Loan Stock.

Upon completion of the extension to the plant of the Rhodesia Copper Refineries, nearly the whole of Nchanga's production will be in the form of electrolytic copper.

The production of blister copper during the last financial year was 38,761 l.tons compared with 32,877 during the preceding year. 1,275,400 s.tons of ore were treated and the concentrates produced were railed to N'kana for smelting.

There was a working profit of £1,531,310 compared with £1,609,924 the previous year. Deducting £834,602 for taxation, the net profit for the year was £696,708 as against £787,309. Unappropriated profits at March 31, 1950, amounted to £129,239 compared with £1,214,503. This big difference is accounted for by transfer to General Reserve of £1,200,000. The company is meeting the balance needed for the first completed stage of expansion to 64,000 tons per annum from revenue reserve. A maiden dividend of 20 per cent was declared for the year ended March 31, 1950.

Total ore reserves as at April 1, 1950, were estimated at 138,391,954 s.tons, averaging 4.66 per cent copper.

## COPPER PRICE; LABOUR RELATIONS; DOMICILE

The Ministry of Supply has continued to take the major part of the copper outputs of the Northern Rhodesian producers, basing its contracts with them on the New York export price as was agreed after devaluation in 1949. The producers have consequently derived full benefit from the realignment of currencies, and the rapid price rise of the metal.

There have been certain matters in dispute with both the European and African employees. The Board of Inquiry, which had been investigating the miners claim for a forty-hour week, came to the conclusion that the economic development of the territory was of greater importance than increased leisure and decided in favour of continuing the forty-eight hour week.

Recent negotiations with the African miners have resulted in the latter being given an all-round wage increase as well as a bonus which this year will amount to around £250,000.

Both the Rhokana Corporation and Nchanga Consolidated transferred their seat of management and control of their affairs to Rhodesia as from January 1 last; they are retaining their registered offices in London. So long as the control of the companies remained in the U.K. they were treated as U.K. residents for tax purposes even though their operations are carried out in Northern Rhodesia. Under these conditions the companies were finding it difficult to retain sufficient profits (after U.K. tax) to provide for effective plant maintenance, replacement and property development, and at the same time pay shareholders an adequate return on their investment.

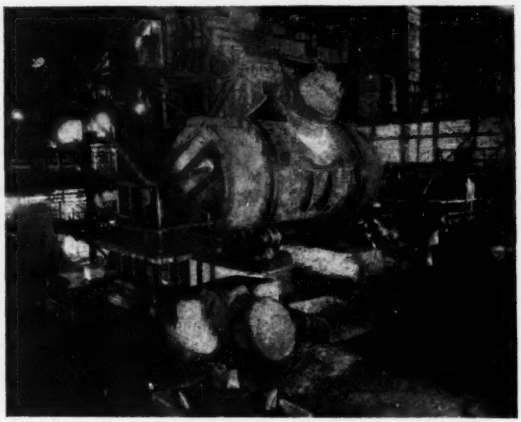
# Roan Antelope Copper Mines Limited

ROAN ANTELOPE holds pride of place as the earliest producer of copper in the Northern Rhodesia copper belt. The mining property is situated about 24 miles from Ndola, in the Luangwa District of Northern Rhodesia, and the area comprises the Roan Antelope, Rietbok, Roan Antelope Extension and Muliashi mining locations. There are extensive deposits of disseminated copper sulphide occurring in a bed in sedimentary rocks, folded into a regular synclinal trough, which have been worked with profitable results.

Operations have now been carried on for over two decades. The company was formed in 1927 and after a programme of drilling and development, production commenced in the early thirties.

Large ore reserves had by then been established, and at June 30, 1950, the remaining reserves were estimated at 93,317,965 s.tons containing 3.25 per cent copper. This is the gross tonnage and is subject to mining losses; the grade is subject to dilution in mining.

During the financial year to June 30, 1950, the output of blister copper amounted to 63,557 l.tons compared with 56,162 the previous year. Revenue from sales rose to £127 4s. 7d. a ton against £120 7s. 9d., but the company had to report a slight increase in working costs to £73 1s. 2d. against £72 14s. 11d. Allowing for replacements and obsolescence, the total cost rose to £87 4s. 4d. compared with £85 4s. 2d. Mineral royalties were higher and there was a slight increase in the cost of smelting. Total copper revenue rose to £7,895,695 compared with £6,580,693 and after meeting mining costs, the operating surplus increased to £3,440,462 as against £2,774,401. After allowing £900,000 provision for replacements, administration expenses totalling £90,227 and loan stock interest, the profit before taxation was £2,434,533 as against £1,963,065. Taxation amounted to £1,615,594 and a transfer was made to general reserve of £100,000. The total dividend was increased from 1s. 1½d. to 1s. 3d. per 5s. share.



**Ladle tipping copper matte into the converter at Mufulira Copper Mines**

The mill dealt with 3,366,500 s.tons of ore, which was the highest on record and there was an increase in the overall copper recovery from 89.79 per cent to 90.50 per cent compared with the previous year.

Development proceeded satisfactorily on the Roan Extension area at the western end of the mine which, during four and a half years, has cost about £1,000,000 to bring into production.

The company has acquired a 30 per cent participation in exploratory work which the Mufulira Company is carrying out in the western part of the N. Rhodesia Copper Belt, but it is not yet possible to form an opinion as to whether the area is likely to contain payable ore bodies.

The installation of rock hoisting and pumping facilities at Irwin Shaft have been well advanced and will permit the shaft to be fully commissioned early in 1951. This will complete the programme designed to bring about simultaneous mining of the east and west ends of the Roan Basin and Roan Extension areas.

There were no interruptions during the year on account of shortage of fuel, as the lack of sufficient coal was mitigated by continuing wood-burning.

There were two short strikes which together caused an interruption of three days, and the matters in dispute were ultimately settled with the European trade union, either by discussion or through conciliation.

The company's production of copper has continued to be sold almost entirely to the Ministry of Supply at a price based on the United States export quotation for electrolytic copper, subject to necessary adjustment made to prevailing differentials for the various grades of blister copper.

# Mufulira Copper Mines Limited

BY ordinary standards the Northern Rhodesia copper industry is reckoned as young, and of the group of mining undertakings forming it, Mufulira is one of the youngest. It was incorporated just over 21 years ago after drilling had indicated the existence of large ore reserves on its area of 149,684 acres in the Luangwa district of Northern Rhodesia. It is at present working the Mufulira Special Grant area and substantial ore reserves have also been proved on the Chambishi and Baluba areas.

The company's early operations were hindered by general world depression in the thirties, but after this had passed and the mine's smelter was brought into operation in 1937, good progress was made. Since then, results have fully justified the confidence shown when the company was formed under the aegis of Rhodesian Selection Trust Ltd., which holds approximately a 64 per cent interest in Mufulira.

The company's achievements were strikingly underlined when the result of operations for the year to June 30, 1950, were made known. Production of blister copper amounted to 77,048 l.tons compared with 70,966 tons the previous year and on the bigger production, costs per ton including selling and administration, amounted to £54 19s. 6d. against £54 12s. 2d. Adding provision for replacements, £9 2s. 2d., the total costs were £64 1s. 8d. against £61 13s. 1d. per ton. This was slightly more than half the revenue from copper sales, which amounted to £126 7s. against £121 8s. 9d. per ton.

The operating surplus for the year was £4,958,493 against £4,778,903, and after meeting administrative charges, placing £700,000 to replacements and providing £2,570,563 for taxation, the net profit was £1,606,172 against £1,723,362. The dividend was maintained at 8s. 6d. per £1 share.

To obtain these results the company crushed a record tonnage of 3,101,511 compared with 2,940,976 s.tons in the previous year. Ore reserves at June 30, 1950, including the Chambishi and Baluba properties and the ore outlined by the underground drilling in connection with the location of the Peterson Shafts, were estimated at the largest figure yet attained of 162,822,000 s.tons subject to mining losses. The grade is estimated at 3.89 per cent copper, subject to dilution in mining.

Towards the end of the year a start was made on the construction of the Electrolytic Refinery, which will have an initial capacity of 36,000 l.tons of electrolytic copper per annum. It is expected to be in production by about April, 1952.

During last year progress was made in the block-caving mining methods which accounted for 56 per cent of the tonnage hoisted. Sufficient sub-level development was carried out to maintain and increase the fully developed ore reserves and production has continued also from conventional open stoping mainly at the western end of the mine.

In addition to items of plant construction, important surface installations were completed or put in hand. Workshops were erected together with houses for European and native workers. Relations with employees continued to be satisfactory and a new cost of living allowance scheme was brought into operation.

Coal for the Copperbelt has continued in short supply and wood-burning was continued in order to avoid restricted production. Since the end of the financial year, however, there has been a further deterioration in the fuel position, and looking ahead it appears as if the problem may again develop, as it has done in the past, into one of carrying capacity on the railways rather than of colliery output.

The company's copper, as in recent years, has been sold almost entirely to the Ministry of Supply. It is sold, to all intents and purposes, on the basis of quotations for the price of electrolytic copper f.a.s. New York, with necessary adjustment made to prevailing differentials for the various grades of blister copper.

## Selection Trust

SELECTION TRUST was first formed by Mr. A. Chester Beatty in December, 1914, as a private company and was converted into a public company in January, 1925. This company was liquidated in 1930 and its principal assets and business activities were taken over by Canadian Selection Co. Ltd., which was incorporated in Canada in that year. In November, 1933, Selection Trust was re-established in England and acquired all the issued capital of the Canadian Selection Co., and the latter company was liquidated. The present issued capital of Selection Trust is £2,242,399 represented by 4,484,797 Ordinary stock units of 10s. each.

Seltrust Investments is an investment trust subsidiary company of Selection Trust, having an issued capital of £1,900,000. Selection Trust holds all the 650,000 issued Ordinary shares, and 250,000 Preference shares out of 1,250,000 Preference shares issued. Its principal holdings are 294,000 shares of common stock of The American Metal Co., and 1,900,000 stock units of 5s. each of Consolidated African Selection Trust. Other valuable interests are held in Tsumeb Corporation and Western Holdings.

African Selection Trust (Proprietary) is incorporated in the Union of South Africa and has an issued capital of £S.A.100,000, all of which is held by Seltrust Investments.

Selection Trust's main interests are in: (a) the Northern Rhodesian Copperbelt through the American Metal Co., (b) diamond production through Consolidated African Selection Trust, (c) gold areas in the Orange Free State, (d) base metal in South-West Africa through Tsumeb Corporation, and (e) oil in Venezuela through Ultramar Co.

Selection Trust participates with Johannesburg Consolidated Investment Co. to the extent of 40 per cent in the examination of areas in the West Rand over which that company holds prospecting and/or mineral rights.

The American Metal Co. carries on a base metal mining, smelting and marketing business, mainly through various agencies throughout the world. It has large interests in the copper-producing industry by reason of its 32.65 per cent holding in the issued capital of Roan Antelope Copper Mines and 50.61 per cent of the capital of Rhodesian Selection Trust. This latter company's principal holding is a 64 per cent interest in the issued capital of Mufulira Copper Mines. For the year ended December 31, 1950, The American Metal Co. had a surplus of $8,036,090. Dividends totalling $2 per common share were declared and a stock bonus of 5 per cent distributed. The surplus was $5,574,158 in 1949 when dividends of $2 per common share were paid, the same as for 1948. 50c. per common share has so far been paid in respect of 1951.

Selection Trust was one of the early entrants into the Orange Free State gold field. It acquired options over mineral rights on an area in the Odendaalsrus district, lying between St. Helena and the Sand River, and also to the south of the river. A 50 per cent interest in these options was ceded to Union Corporation in exchange for which that Corporation ceded to Selection Trust a large interest in business which it had concluded with Western Holdings. Under these arrangements Selection Trust became interested in St. Helena Gold Mines, Western Holdings and Welkom Gold Mines, particulars of which appear elsewhere in this *Review*.

Selection Trust brought to fruition as a first-class lead-zinc producer the Trepca Mines. These mines were nationalized by the Yugoslav Government, which has agreed to pay to the British Government £4,500,000, in instalments over eight years, as compensation for nationalized British property. The British Government has set up a Foreign Compensation Commission to deal with individual claims to this compensation.

Under an agreement between the two companies, Selection Trust offers Trepca a 20 per cent participation in all new mining business which it undertakes. Selection Trust is entitled to 10 per cent of the net annual profits of Trepca and has the option to subscribe for 1,000,000 Trepca 5s. shares at par and a further 1,000,000 at 6s.

For the year to March 31, 1950, the income of Selection Trust and its subsidiaries was £933,517. Dividends from investments were £731,742, profits from realization of investments £177,998. After meeting administration and other expenses and paying debenture interest the net revenue was £864,774 against £890,355. Taxation absorbed £376,338, the dividend was 2s., investment reserve received £150,000 and exploration reserve £50,000. Depreciation of investments, £259,120, was provided out of investment reserve. The consolidated balance sheet showed total investments of £3,255,292. An interim dividend of 1s. has been paid for the current year.

## Consolidated African Selection Trust

THIS company is engaged in alluvial diamond mining mainly in the Gold Coast and Sierra Leone. It began to operate in the Gold Coast in 1924 and now holds concessions totalling 68 square miles. The mine headquarters are at Akwatia, 65 miles from Accra. Production for the calendar year 1950 was 488,287 cts. of which 15 per cent were gem and 85 per cent industrial goods.

In 1934, through a wholly owned subsidiary, Sierra Leone Selection Trust Ltd., the company obtained an exclusive diamond licence for diamond mining in practically the whole of Sierra Leone. The mine headquarters are at Yengema, 300 miles from Freetown. Production for the calendar year 1950 was 655,485 cts. of which 34 per cent were gem and 66 per cent industrial goods.

Helped by experience gained in the war, uses of diamond in industry have expanded considerably. The demand still remains high and has added substantially to the earning powers of the company. In addition, this company has, during its existence, built up a strong financial position and should be able successfully to withstand the effects of any future recession.

The company has always realized that it is not only in its own interest but also in the interest of its employees to provide Africans, as well as Europeans, with a good standard of living and good wages. In view of the rise in the cost of living, increases in pay have been granted both to the African and European personnel during the year. Considerable progress has been made in improving the accommodation provided for African Employees. Additional hospital facilities, welfare clinics and club premises have been completed. The company combats local profiteering in foodstuffs, etc. by bulk buying and subsidization of goods sold through its canteens. The company sponsors the training of apprentices and the grants of scholarships to children of African personnel. In commemoration of 25 years operations in the Gold Coast the company is building a Community Centre at Kibi, the local State capital.

During the past year the company has made considerable progress in the introduction and development of mechanized mining methods. When the difficulties of training African personnel in the use of the new machinery have been overcome, a marked increase in yardage handled is expected. A new gravel treatment plant has also been tested in the Gold Coast with satisfactory results. Experience gained with this new unit will be used in the plant re-equipment programme. Prospecting has been actively pursued in both territories and the reserve position remains satisfactory.

A factor which has a prejudicial effect on operations in the Gold Coast is the very serious growth of diamond thefts and illicit mining activities over the last two years. There is no doubt that important quantities of diamond have been stolen from the mines and plants at various stages of operations. All possible steps are being taken, with the close co-operation of the Gold Coast authorities, to reduce the loss through these causes, but the protection of concessions from illicit mining in the thick African bush presents great difficulties.

The current contracts with the Diamond Corporation Ltd. for the sale of the companies' production were due to expire on December 31, 1950. As a consequence of the devaluation of sterling, however, their revision became necessary and it was decided to take the opportunity which thus arose to review the whole situation from a long term point of view. As a result, new contracts covering all diamond material produced by the companies and operative from January 1, 1950, for a period of six years, were entered into with the Diamond Corporation Ltd. and with Industrial Distributors Ltd. on satisfactory terms. The new arrangements will result in a substantial increase in the earnings for industrial production, and provide for the automatic adjustment of the prices for gem goods in accordance with market variations.

During the year to June 30, 1950, combined profits of the company and its subsidiaries were lower at £2,366,255 against £2,589,640 in 1949. Group taxation was £1,242,500 against £1,367,752. Allocation to replacements and extensions was lower at £250,000 against £350,000. General reserve allocations were £116,273 against £107,793. Dividends (4s. in all) required £667,284 against £583,874 net, which is equal to 44 per cent of issued capital after tax. This financial policy resulted in a further increase of liquid resources, which as shown in the consolidated Balance Sheet, amount to £3,924,000.

The lower earnings during the year to June 30, 1950 were forecast last year. However, with the new diamond sales contracts and the recent increases in the price of diamonds, the outlook is favourable.

# Gold Coast Selection Trust Group

THE year 1950 will long be remembered in the Gold Coast as the year in which a Constitution was granted to the Colony, endowing it with a large measure of self-government. Politicians shouting from the hustings rarely, if ever, act as a market tonic. Hence from the time the political agitation for "self-government now" began in earnest in the closing months of 1949 to the early part of the present year, the market for "West Africans" was out of favour with the investing public, despite the excellent results recorded.

There is good reason to believe that the political and economic situat on in the Gold Coast has now been stabilized with the result that the Colony's gold mining producers stand in need of reassessment. Furthermore, the mining industry has gone ahead with its plans, shelved during the war, for improving the working and living conditions of the African and this wise policy has already had the effect of reducing the labour turnover at the mines.

## GOLD COAST SELECTION TRUST

Gold Coast Selection Trust is the outstanding holding and finance company concerned with the West African gold mining industry.

From the date of its formation in 1928, its policy has been to acquire concessions and mining rights on the Gold Coast to prove them, and like the leading finance houses connected with the South African gold mining industry, to dispose of them in return for block of shares, to operating companies. The first of the Trust's subsidiaries so floated was Marlu Gold Mining Areas and the second, Bremang Gold Dredging. Other important interests include Gold Coast Main Reef, in which the Trust acquired a substantial block of shares as consideration for property sold to that company. The Trust also owns large shareholdings in Amalgamated Banket Areas and Ariston Gold Mines. At September 30, 1950, the holdings of the Trust in these five companies had a market value of £1,917,903 as compared with a book cost of £1,590,910.

The companies in the Trust's portfolio have all benefitted from devaluation and income from dividends and interest has risen by £35,206 to £113,373. Revenue from sales of investments has also improved, moving up by £5,754 to £28,514, which in view of the general lack of interest in the West African market constitutes a notable achievement.

The better results attracted more tax, £31,774 against £21,359, but net earnings of £102,492 (compared with £71,130) provided substantial cover for the interim dividend of 7½ per cent, which was paid last September, absorbing £30,937. The sum of £75,000 was transferred to the reserve account, which now amounts to £375,000, leaving a credit balance carried forward on profit and loss account of £320,297.

Since the end of the financial year the Trust has sold to Bremang Gold Dredging its concessions and options over alluvial properties covering some 67 miles of the river bed of the Offin/Jimi rivers in the Gold Coast and Ashanti provinces. In pursuance of its usual policy, the Trust accepted £91,650 in stock units of Bremang, and will receive a royalty of 4 per cent of the gross value of the gold recovered from these areas. It is expected that Bremang will begin dredging operations on the Offin River in the summer of 1953.

## MARLU GOLD MINING AREAS, LTD.

This company's properties on the Prestea Ashanti line of reef cover an area of approximately 18.3 sq. miles. During the war it was one of the mines placed on a care and maintenance basis and although its ore reserves and mining machinery were kept intact, considerable difficulty has been experienced in regaining its pre-war position when, for example, it paid 25 per cent in 1939 out of earnings amounting to £421,343.

Nevertheless, many of the difficulties which dogged its recovery in the immediate post-war period, such as the acute shortage of plant and spare parts for replacement and for conversion of its shovel excavators, lack of working faces due to landslides, and the shortage of experienced labour, had been overcome by the end of September, 1949. Thus, the company was in a good position to reap the benefits of devaluation.

The extent to which the higher price of gold and improved operating efficiency have combined to produce good results can be seen from the report and accounts dealing with the year ended September 30, 1950. In spite of a longer ore haulage to the treatment plant, tonnage crushed increased by over 90,000 tons to 500,740 tons. Recovery improved to 85.9 per cent (compared with 83.6 per cent), milling costs dropped 8d. to 6s. 11d. per ton, and the output of gold rose to 52,036 oz. compared with 42,832 oz. previously. The better production results and plant performance reacted favourably on the profit and loss account and gross revenue amounted to £642,533 against £392,626. Mining expenditure was, of course, higher, and after deducting all expenses, net profit was £187,570, as against a loss of £12,045 in 1949. The net profit available was applied to reducing the company's debit balance, which had grown from £69,405 in 1943 to £214,758 in 1949, and this now stands at the relatively low figure of £27,188.

Ore reserves (including indicated and probable ore) at the end of September, 1950, totalled 3,373,637 tons (averaging 3.21 dwt. per ton), of which 497,615 tons (averaging 6.95 dwt. per ton) was sulphide ore. In this connection, a start has been made on the building of a separate mill to treat the sulphide ore and it is expected that this plant, capable of treating 4,500 tons per month, will be in partial operation by about the end of this year.

Since the end of the financial year the average monthly milling rate has declined to 39,408 tons per month compared with 41,728 tons per month during the period under review. However, the target figure of 45,000 tons per month was reached in February of this year when 45,700 tons were produced. The lower rate was due to an unforeseen mishap to one of the company's electrically operated mechanical shovels and to mechanical trouble with the articulated locomotive. Therefore, the net mine profit of £62,312 obtained from the 236,450 tons milled during the first six months of the current year must take these factors into account.

In view of the limited results obtained, it has been decided not to sink a shaft in the Broomassie area, which at one time was considered as a joint venture with Ariston Gold Mines whose property Marlu adjoins.

## AMALGAMATED BANKET AREAS

The outstanding event in connection with this company's operations during the year to September 30, 1950, was the coming into operation on January 1, 1950, of the agreement under which the company acquired the undertakings, properties and assets (subject to liabilities) of Gold Coast Banket Areas Ltd. and South Banket Areas Ltd., together with certain leasehold mining concessions from Banket Gold Fields Ltd. The consolidated properties of Amalgamated Banket Areas now cover some 85 square miles in the Tarkwa Banket Goldfield, of which about one-fifth has so far been developed.

In effect the amalgamation scheme has brought five sections within the company's working areas: Pepe (opencast), Akoon, and Taquah/Maintraim which comprise the original A.B.A. sections, the Fanti Mine formerly belonging to Gold Coast Banket Areas, and the Tamsoo Mine acquired from South Banket Areas. No production, however, was obtained from the two new properties except for approximately three months from the Fanti Mine.

One of the chief economies envisaged by the amalgamation scheme was the treatment of ore in the Central Mill at Abbontiakoon instead of in the three separate plants. Fortunately there was in existence on the three properties sufficient lengths of ropeways to connect, after realignment, the Fanti and Tamsoo Mines to the Central Mill for the transport of ore. Work on the aerial ropeway between Tamsoo and the Central Mill will be completed early in June, 1951, and this mine will soon be delivering ore, thereby providing Amalgamated Banket with an additional source of revenue. Work on the aerial ropeway to connect Fanti with the Central Mill has begun and it is expected that this mine will also be a producing and profit earning section some time in 1952.

Meanwhtile development work at both mines is being pushed ahead with all speed. At Fanti, footage advanced during the nine months ended September 30, 1950, totalled 6,813 ft. Of this figure, 4,603 ft. were in drives, 3,917 ft. of which when sampled, revealed 1,488 ft. payable, averaging 6.3 dwt. over 37 in. Of the 3,542 ft. advanced since January, 1950, at Tamsoo, 2,436 ft. of driving were sampled and revealed 396 ft. payable, averaging 4.3 dwt. over 36 in. Stope preparations are well advanced in anticipation of the ropeway being completed and ore delivery should begin smoothly.

The accounts of Amalgamated Banket Areas reflect the acquisition, as from January 1, 1950, of the undertakings mentioned above and profits have been charged with the full cost of the heavy maintenance expenditure on the Fanti and Tamsoo Mines as well as with the cost of financing their respective development programmes. Nevertheless, financial results have never been better. After charging depreciation of plant and machinery, development expenditure totalling £136,654, and all other expenses, net profit amounted to £203,402, which is a distinctly favourable contrast to the

mere £1,633 earned in 1949. From the £205,035 available, expenditure pending resumption of production at Fanti and Tamsoo Mines absorbed £64,297, expenses connected with amalgamation and the reduction of capital required £14,175, and after accounting for a small appropriation of £111, the remainder, £126,452, was carried forward.

Plans over the next two years according to the chairman, Major-General Richards, envisage a production of 40-45,000 tons of underground ore and 15-20,000 tons of Pepe (opencast) ore per month. The designed treatment capacity of the Central Mill is 60,000 tons per month, so that, with certain modifications, adequate milling capacity should be available. Nor do there appear to be any difficulties standing in the way of achieving this target. In the first six months of the current year, plant performance has continued to improve. Tonnage crushed showed a monthly average of 53,349 tons compared with an average monthly milling rate of 44,807 tons during the period under review. The results for the quarter ended March 31 last are even better, the monthly average reaching 55,765 tons. Thus the lower of the two target figures should soon be attained when ore deliveries from the Tamsoo Mine commence.

## BREMANG GOLD DREDGING CO., LTD.

This company's properties are situated along the banks of the Ankobra River, Gold Coast Colony, and cover an area aggregating some 30 square miles, extending approximately 40 miles up river from the Ariston Gold Mines. Its four dredges are all in operation, but the ground still available to No. 2 dredge is expected to be worked out by the end of the year, and the economic life of the areas on which the other three dredges are working is estimated to be about eight to ten years. Ore reserves at December 31, 1949, were estimated at 46,094,500 cu. yd., valued at 3.12 grains per cu. yd. Thus the arrangements made in January of this year to purchase the Offin/Jimi rivers alluvial areas owned by the Gold Coast Selection Trust can readily be appreciated.

These areas are located some 25 miles north-east of the company's existing properties and extend along the Offin River from five miles below Dunkwa Town to the border of the Ashanti Goldfields property. They have been extensively proved and are estimated to contain some 175,000,000 cu. yd. of alluvial deposits, valued at 2.63 grains per cu. yd., equivalent to 872,603 f.oz. of gold. At current rates of production these new acquisitions extend the profitable life of the company's operations by between twenty-five and thirty years. Payment to Gold Coast Selection Trust was effected by the company issuing to the Trust stock units to the nominal value of £91,650, together with the payment to be made to the Trust of a royalty of 4 per cent of the gross value of gold recovered from these areas. To enable the company to fulfil the former part of the purchase consideration, it was necessary to increase its authorized capital. Although in fact only £54,212 was immediately required, the opportunity was taken to increase the authorized capital by £250,000 to £1,250,000 and the issued capital by the amount required, namely £54,212, thus bringing total issued capital to £1,054,212.

At the extraordinary meeting held in January last to inform shareholders of the Offin/Jimi alluvial areas transaction with Gold Coast Selection Trust, the chairman said that although final returns would not be available until mid 1951, operating results for the current year ended December 31, 1950, showed that 8,707,130 cu. yd. were treated for the recovery of 38,070 f.oz., giving an operating profit of £177,985. This figure was subject to adjustment for depreciation, London offices charges, taxation, etc. Dividends of 10 per cent plus a bonus of 5 per cent were paid for 1948, and 10 per cent was paid for 1949.

Results for the first quarter of 1951, ended March 31, 1951, revealed that 2,204,500 cu. yd. were treated from which 10,497 f.oz. were recovered for an aggregate operating profit of £62,539.

## ARISTON GOLD MINES (1929) LTD.

Registered in 1929 to acquire the Prestea Mine in the Gold Coast Colony, Ariston enlarged its areas three years later by acquiring additional properties. At present its properties comprise an area of about 5,036 acres, extending over 6.25 miles along the strike of the reef in the Prestea District.

For the twelve months ended September 30, 1950, operating results have been impressive and fully reflect the benefits of the first year in which the higher gold price has been operative. Not all the credit, however, for Ariston's excellent performance can be attributed to devaluation. Tonnage milled at 293,000 tons was the highest in its history; in addition to the 99,722 oz. produced from milling, 3,840 oz. were recovered from old residues, the total of 103,562 oz. constituting the highest yield in the annals of the company; the grade of ore treated increased; and finally, record earnings were achieved—net profit amounting to £249,542 against £149,375, an advance of no less than 66 per cent. From the £369,938 available, dividend payments totalling 9d. per share against 6d. absorbed a net amount of £185,625 and after writing off £108,520, including £100,000 written off in connection with the Broomassie Drive, the carry forward amounted to £75,793 compared with £75,515 previously.

Underground development during the year was satisfactory at depth on both the North and Main ore bodies and good values were also obtained on the West Reef on the 9th, 10th, 18th, 21st and 22nd levels. In June last the sinking of South Waste Shaft was started. This work is expected to be completed in June, and lower costs and higher efficiency will result.

Although Ariston has not been able to escape rising costs which during the year totalled 49s. 9½d. per ton milled against 42s. 11d., the current year's results indicate that its satisfactory position will be maintained. For the first six months of the current year tonnage milled totalled 163,910 tons. Gross mine revenue during the same period amounted to £636,691, representing an increase of £44,115 over the corresponding period of the previous year, although total mine working profit at £286,056 showed a decline of £11,393 over the same period of the previous year.

An interim dividend of 7½ per cent, equivalent to 2½d. per unit, less tax, has been declared in respect of the current year.

## GOLD COAST MAIN REEF

Incorporated in 1933, this company's mine is divided into three sections, the Tuappim workings in the south and the Bondaye and Ekotokroo workings, which have a common frontier with Ariston Gold Mines, in the north. All three sections are in active development and production.

For the year ended June 30, 1949, developments in the Tuappim section on levels 5, 8 and 9 were disappointing but on No. 10 level a footwall branch of the reef was exposed for a length of 105 ft., averaging 11.53 dwt. per ton over 76.5 in., and on the main fissure 1002 Drive proved a shoot 210 ft. long, averaging 13.72 dwt. per ton over 45 in. Shaft sinking is proceeding and at the end of the current year, June 30, 1950, No. 12 level had been reached.

In the Bondaye section, development on the spur reef on levels 12, 13, 14 and 15 proved reasonably good apart from a tendency for the ore body to shorten below level 13. On the main reef, where development work had suggested that a poor zone existed between 10 and 16 levels, the remarkable results of the current year's work on No. 13 level have tended to belie these findings. In June last, for example, 30 ft. were exposed on No. 13 level, averaging 21.94 dwt. per ton over 71.3 in. This drive was continued and at September 30, 1950, the total payshoot exposed was 200 ft., averaging 18.99 dwt. over 66 in., equivalent to 1,253 in.-dwt. Shaft sinking continued in the section throughout the current year and at September 30, 1950, No. 18 level had been reached.

Much interest and importance attaches to the development of the Ekotokroo section, which has a common boundary with Ariston Gold Mines, for it is hoped that Ariston will prove the southward extension of their workings to the company's boundary, and that the reef will continue through Ekotokroo to Bondaye and Tuappim in that order. Insufficient labour restricted development work in this section but results obtained on levels 4, 5 and 7 were definitely encouraging.

The profit and loss account for the year ended June 30, 1949, showed that working profit for the year amounted to £63,616 (£50,547) to which was added £34,109 brought in, making £97,725 available. After making provision for taxation amounting to £21,005 and for the payment of two interim dividends, one of 2½ per cent and another of 5 per cent absorbing £45,967 (same), the balance remaining of £30,753 was carried forward.

During the year 115,116 tons were treated for a recovery of 45,223 oz., against 104,204 tons for 41,826 oz. in the previous year. Working costs decreased by 2s. 6d. to 50s. 1d. per ton milled. Ore reserves at the end of the period totalled 374,510 tons of an average value of 8.73 dwt. per ton over a width of 67.1 in., equivalent to a working supply of four years.

For the current year ended June 30, 1950, it is reported that 97,944 tons were treated for a recovery of 28,983 oz. of an average value of 6.786 dwt. per ton.

Results for the period since that covered by the last report and accounts, are summarized in the following table:

| Quarter | Tons | Dwt./ton | Cost | Profit | Dev.F'tage |
|---|---|---|---|---|---|
| Sept., 1949 | 27,228 | 6.638 | 50s. | 6s. 4d. | 1,876 |
| Dec., 1949 | 24,802 | 6.804 | 57s.11d. | 17s.1½d. | 2,090 |
| Mar., 1950 | 23,652 | 6.271 | 64s. | 6s.2.4d. | 2,333 |
| June, 1950 | 22,262 | 6.99 | 65s.4d. | 10s.1.3d. | 2,405 |
| Sept., 1950 | 23,074 | 6.163 | 57s. | 19s.5d. | 1,912 |
| Dec., 1950 | 23,234 | 6.080 | 58s.2d. | 17s.2d. | 1,883 |

For the quarter ended March 31, 1951, working profit of £28,054 was derived from treating 24,921 tons yielding 8,770 oz.

# Ashanti Goldfields Corporation Ltd.

## Progress with long term development programme

ASHANTI GOLDFIELDS CORPORATION may fairly be described as one of the richest and most successful gold producers. Formed in 1897 by a London merchant trader named Cade, the Corporation had, up to March 31, 1950, produced no less than 6,381,254 oz. of gold out of a total recorded production since 1880 of 18,058,809 oz. from the Gold Coast Colony as a whole. The properties, extending over 100 square miles, are located at Obuasi, about 90 miles north of the Port of Takoradi, and consist of a group of mines including Ashanti, Cote d'Or, Obuasi, Sansu, Ayeinm, Justices and Blackies—the largest and most valuable of these being Ashanti.

Spectacularly consistent as has been the progress of the Corporation, a crucial point in its history arose in the early nineteen-thirties when it was realized that unless consistent values were located below the 29th level, the end of Ashanti as a high grade producer was in sight. These doubts were happily resolved in 1937 when diamond drilling and subsequent development disclosed the downward extension of a solid reef carrying high values. Moreover, the earlier failure to locate this reef had led to the exploration and development of the southern ore shoot on the Obuasi fissure and the expansion of the Corporation's mining activities to include plans for the re-opening of Ayeinm and Sansu Mines. But having located this reef it was then necessary to make accommodation for its exploitation. Subsequently a plan was evolved which was designed to make the fullest use of the new developments in depth by the provision of improved facilities, both underground and on the surface.

### THE SIX-POINT PROGRAMME

The fulfilment of this plan involved six major requirements: (1) Another shaft (South Shaft) to work the Obuasi south shoot and the lower levels on the Cote d'Or fissure. (2) A new and centrally situated ventilation shaft to ameliorate working conditions at depth. (3) A new aerial ropeway with a capacity of 150 tons per hour to connect all the shafts with the treatment plant. (4) A new treatment plant for flotation concentration with an initial capacity of 20,000 tons per month. (5) Another shaft (Eaton Turner Shaft), would need to be sunk at some later date, to work the reef at the north end of the mine. (6) Large-scale afforestation programme, to provide fuel for power and for the ore roasting furnaces, and pit props for the mine.

Work on this formidable six-point programme commenced in 1938, but the war and the Gold Coast Concentration Scheme rendered its completion impossible at that time.

Nevertheless, its realization remained the basis of the Corporation's policy in the post-war period. By the end of September, 1949, the south shaft had been sunk to a depth of 2,094 ft., and the circular ventilation shaft had been sunk to a depth of 1,166 ft. The aerial ropeway had been completed. The new treatment plant, known as the Pompora plant, had been sited on the slope of a hill in the Pompora valley to the north of the old dry crushing and roasting plant and had been commissioned for over two years. Up to this date, too, the site for the Eaton Turner shaft had been prepared and the preliminary work at the collar begun. The afforestation scheme had been very successful.

### AYEINM AND SANSU RE-OPENED

In addition to the above-mentioned tasks work had progressed favourably on the re-opening of the two low grade schist mines, Ayeinm and Sansu. At Ayeinm, despite a continued shortage of labour, output increased in the year to September 30, 1949, by 7,056 tons to 23,020 tons, and the main shaft was sunk a further 111 ft. to a total depth of 122 ft. below No. 10 level. At Sansu plans for de-watering the mine were put in hand in 1947 and at the end of September, 1949, No. 8 level was finally de-watered and the mine prepared for full scale development.

To complete, in broad outline, the picture of the Corporation at the time of devaluation it remains to add that the average monthly crushing rate was running at 18,000 tons, the ore reserves stood at 1,643,000 tons averaging 18.9 dwt., equivalent to over nine year's supply, and the total development footage advanced during the year amounted to 19,786 ft., a figure which had not been bettered since 1941.

The accounts for the year ended September 30, 1950, showed that earnings had increased by £470,794 to £1,138,426, while this very satisfactory result was largely attributable to the first full year in which the higher gold price had been operative, it was also due to the greater tonnage treated, which at 218,670 tons was the highest recorded since 1941, the slightly higher grade of ore mined, 19.01 dwt. against 18.66 dwt., and to the improved metallurgical extraction. The net result was that 189,815 oz. were recovered, an increase of 6,914 oz. over 1949. The steep rise in profits attracted an equally steep rise in taxation, which advanced to £449,825 against £253,571. Replacement reserve account received a further £25,000, bringing it up to £75,000.

The general reserve was increased by £175,000 to £300,000. Nevertheless, the distribution for the year kept pace with the higher earnings, 66⅔ per cent being paid, compared with 40 per cent paid previously. After provision had been made for these, and all other appropriations, the balance carried forward was £213,507, a decrease of £7,631.

Development footage advanced during the year, including 1,333 ft. of shaft sinking, totalled 27,894 ft., an increase of 8,108 ft. on the previous year. The Obuasi, Cote d'Or and Main Reefs continued to give good values, the estimated quantity of new ore added to reserve as a result of work carried out on these three reefs amounting to 187,864 tons averaging 17.5 dwt. per ton. The most important development was that carried out on the Main Reef on level 33, where the tonnage so far developed at the north end of the level is estimated at approximately 30,000 tons averaging 31 dwt. per ton.

### POMPORA TO TREAT SANSU ORE

During the year to the end of September, 1950, the opening up of both the Ayeinm and Sansu Mines continued. Output from Ayeinm increased by 5,806 tons to 28,836 tons, and the main shaft was sunk a further 160 ft. to No. 12 level horizon. The opening up of this level is being undertaken currently. Activity was accelerated at Sansu. The main shaft was sunk 77 ft. to a total of 781 ft. below the collar, a new level, No. 9, was commenced, and general development work totalled 5,500 ft. disclosing some interesting results. Payable ore was found on levels 7 and 8 and the total ore indicated was estimated at approximately 160,000 tons averaging 6.5 dwt. per ton, bringing the total so far to just over 400,000 tons at that grade.

Encouraging as the development work has been at Sansu, sufficient lateral and vertical development to prove the value of this deposit has not yet been done, nor has its amenability to treatment on a large scale been established. On the other hand, research work done in the metallurgical laboratory has demonstrated that the process at the Pompora treatment plant is very suitable for dealing with this ore, and arrangements are now in hand to deliver a limited tonnage for treatment. The Corporation is carrying on general prospecting work on some of its "outside mines." Exploratory work in the Sansu-Blackies area was intensified. 7,000 ft. of trenching was completed and 333 ft. of diamond drilling was recorded. Encouraging results were obtained and arrangements are being made for opening up a small opencast working in the Blackies mine, where some 75,000 tons of ore assaying 5-6 dwt. per ton can be mined.

### ASHANTI SEPARATES ITS INTERESTS

An important decision taken by the Corporation during the year was to divide Ashanti Goldfields Corporation into two companies by separating the investment interest from the mining interest. This was done by the formation of a new company known as West African Finance Corporation having an issued capital of £400,000, the whole of which is held by Ashanti Goldfields. This Corporation will administer Ashanti's large interests in Bibiani, Taquah and Abosso, etc., and it will be managed by Ashanti Goldfields, no directors' fees and salaries being paid.

During the first six months of the current year 118,000 tons were treated, from which 95,432 oz. gold were recovered, yielding a net mine profit of £527,605. Work on the Eaton Turner shaft was somewhat curtailed owing to the need for pushing on with other projects, but it is expected that sinking will probably be started later in the year when news of the permanent winding engine permits a definite starting time to be fixed.

# Bibiani (1927) Ltd.

## Milling rate now raised to around 30,000 tons per month.

SITUATED 65 miles north-west of Dunkwa Town, at Bibiani, Gold Coast Colony, this company owns gold mining rights over an area of approximately 16 square miles and timber rights over an area of about 20 square miles. Although its title implies that the mine is of recent origin, in fact the present company is a reconstruction of New Bibiani Ltd., which was formed in the jungle boom of the 1890's. Work commenced on the property as long ago as 1901, but owing to a combination of lack of capital and difficulties in transporting stores, mining operations ceased in 1913.

Mining was resumed in 1927, the former workings being re-opened and dewatered, and in April, 1933, the first treatment plant unit with a daily capacity of 100 tons started production. Two years later tonnage crushed had risen to 67,260 tons yielding 26,063 oz. of gold enabling the company, in its new form, to make its first dividend payment of 12½ per cent on an issued capital of £400,000.

But the year 1935 was important for reasons other than marking the company's maiden distribution. Before plans could be translated into action for embarking upon a large scale development programme and raising plant capacity, doubts about the persistence of values at depth had to be resolved. Dr. W. S. McCann, the consulting geologist, assumed this task and reported that the mineralization was primary and deep-seated and that the fissure which constituted the ore body indicated that the mine lived at depth. From that date up to the year 1940 the company went ahead rapidly. Issued capital was increased to its present figure of £500,000 in 4s. units. Tonnage treated mounted steadily, the 1940 figure being 321,550 tons. Ore reserves were built up and in the same year stood at 2,747,000 tons of an average value of 7.20 dwt.

During the war years, as in the case of Ashanti Goldfields Corporation with which it is associated, Bibiani encountered difficulties of shortage of labour, supplies and equipment. In consequence, tonnage delivered to the mill declined from the 1940 peak to some 255,000 tons per annum, development work of an exploratory nature was reduced to a minimum, and ore reserves, which totalled 2,747,000 tons in 1940, fell to 1,918,000 tons in 1945. Nevertheless, dividend distributions were maintained throughout the war period of 25 per cent, with the exception of 1944 when it dropped to 20 per cent.

Efforts in the post-war period have been directed towards regaining ground lost during the war.

### POST-WAR PROGRESS

Plans were put in hand to open up the mine at depth and to increase output by augmenting the monthly underground tonnage of 22,500 tons from surface excavations on the outcrop of the reef.

The chief feature of the underground development work undertaken during 1948 was the opening up of new ore on the South Reef in depth. Results were distinctly encouraging. The south ore body on No. 15 level was proved over a length of more than 800 ft. with a width of 21½ ft. averaging 5.65 dwt. per ton, and subsequent work proved that this ore body extended upwards to No. 13 and 14 levels. In the following year, work on this ore body was restricted, priority being given to sinking the South Shaft to No. 17 level to facilitate development on the lower levels. But exploration work carried out on the East Reefs produced significant results. Though the ore bodies in this part of the mine were smaller than those in the main channel, they carried higher values thus offsetting to some extent the lower grade of ore encountered on the larger south ore body.

The company's surface reef outcrop has not yet been proved to its full extent and the possibility of it extending to the south of the mine is being examined. The value of the surface ore at around 2.68 dwt. per ton is much lower than the ore obtained from underground, but on the other hand, it can be mined cheaply by mechanical means.

Although devaluation came too late to take full advantage of it for the year ended September 30, 1949—only 5,207 oz. being realized at the higher price—the results for that year showed that the company had advanced to a position from which the full benefits of the higher gold price could be reaped. Tonnage treated amounted to 291,688 tons, equivalent to a monthly milling rate of 24,305 tons, a figure which had been exceeded only twice previously. Ore reserves stood at 1,806,000 tons of an average value of 5.51 dwt., equivalent to over six years' supply at the then prevailing crushing rate. Fifteen new stopes were brought into operation and further working faces could be made available if needed.

### PRODUCTION TARGET REACHED

The most notable achievement during the year ended September 30, 1950, was the raising of the monthly rate of production to a level of 30,000 tons averaging 6,200 oz. This was accomplished according to plan, the underground tonnage delivered to the mill being maintained at 22,500 tons per month and the additional tonnage coming chiefly from the surface quarries. Tonnage crushed during the 12 months was 333,422 tons, the highest in the company's history. This figure would have been improved upon but in June last, a fire occurred in the power house, damaging one engine as well as the main busbar reactor cables resulting in a major loss of power. The treatment plant in consequence was completely idle for one week and for the remainder of the month operated at only three-quarters of its total capacity. This unfortunate mishap lowered production in the June quarter to 77,450 tons compared with 85,000 tons in the March quarter and 88,000 tons in the September quarter. The company is fully insured for both its losses by fire and for consequential loss of output and was awarded £23,500 on its claim arising from this power house fire.

The profit and loss account for 1950 reflected both the better operating results and the first full year's return from the sale of bullion at the higher gold price. Gross revenue amounting to £953,041 was in sharp contrast to the corresponding figure of £602,732 earned in 1949. Expenses generally were higher and after meeting tax liabilities of no less than £141,000 against £10,000, net profit figured at £193,587 compared with £72,030 previously. From this, £193,587 general reserve on capital account received £60,000, the sum of £25,000 was transferred to replacement reserve, dividend payments aggregating 25 per cent absorbed £68,750, and after taking into account all other appropriations, the carry forward was increased by £5,497 to £183,858.

### FUTURE DEVELOPMENT PROGRAMME

Development was on the same scale as in the two previous years and of the 20,328 ft. advanced, exploration accounted for approximately 12,000 ft. As is usually the case in mining, results were mixed. The hope that the values disclosed on the East Reefs during the previous year would extend downwards between 12 and 15 levels was not fulfilled. However, the larger south ore body continued to reveal good results, the development work carried out on levels 16 and 17 providing an additional 173,000 tons of 5.3 dwt. ore to reserves. The full extent of the reefs on these two levels has yet to be proved and work is continuing on both horizons. This latter operation is part of the future development programme and the South Shaft is being sunk to enable this task to be started at an early date. It is intended to sink this shaft to the No. 20 level at which depth the winding equipment will have reached the limit of its capacity and consideration is now being given to the siting and equipment of an internal shaft to provide for future development below this level. The same situation does not apply to the Central Shaft which is amply equipped for several years to come. At the company's fiscal year-end it was midway between levels 16 and 17 and is being extended to the latter level to provide additional hoisting capacity for the development programme. The further development of the East Reefs on levels 13, 14 and 15 is continuing and the possibility of opening up all the reefs at the north end of the mine on levels 10 and 12 is being considered.

Much thought has been given to improving stoping practice over the past few years and during the period under review the shrinkage system of mining was introduced with encouraging results into one new stoping block, while a second block has been opened up for operation by scraper haulers. Results recorded so far indicate that these methods will be successful and the trials are being extended to familiarize the labour with the new systems and to collect data on costs and performance for comparison with the usual method of working.

For the first six months of the current year ended March 31, 1951, 177,500 tons were treated, equivalent to a monthly average output of 29,583 tons, from which 37,434 oz. were recovered, yielding a profit of £106,707.

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# British Guiana Consolidated Goldfields

BRITISH Guiana Consolidated Goldfields Ltd. was incorporated as a private company in June, 1935, and converted into a public company in April, 1936, to acquire mining rights and conduct dredging operations over certain alluvial gold mining areas situated along the rivers Mahdia, Potaro and Konawaruk in British Guiana.

Since 1937 the Mahdia river area has been worked with a dredge made by Lobnitz of Renfrew, and despite the difficult conditions under which it often operated, it averaged a yardage of approximately 800,000 per annum. This area was believed to be nearing exhaustion but it was given a new lease of life by the discovery that at the Upper end its dredging bottom was false and that true bedrock was considerably deeper, the ground between carrying appreciable gold values. Consequently, ore reserves on the Mahdia area were re-calculated and amounted to approximately 1,639,000 cu. yd. at 4.18 grains per cu. yd., thus providing work for the dredge at a useful profit over the next year or two.

In 1948, in anticipation of the Mahdia river area becoming worked out and being in any case most desirous of expanding its activities to include the working of the Potaro and Konawaruk river areas, where good payable dredging ground has been proved, the company mapped out a development programme.

The first stage of the programme was the bringing into production of the Lower Potaro river area and for this work, an additional dredge had to be purchased. To finance the project, the company made an arrangement in 1948 with the Colonial Development Corporation whereby the Corporation loaned the company the sum of £205,371. Unfortunately, the rise in capital costs has absorbed the amount of the loan before this part of the programme could be completed. However, the work is in its final stages and at the beginning of March last the construction of the dredge at Tumatumari (on the Lower Potaro river) was complete except for the main transformer, the delivery of which had been delayed owing to river transportation difficulties. In view, therefore, of the substantial progress already achieved, the company decided not only that the final work on the Lower Potaro river project should be completed but also that the second stage of the development programme should be commenced. In this way the company felt that prime costs would be spread over the greater output expected and that the development of a second area would enlarge the company's profit earning capacity.

The second stage of the programme concerns development of the Upper Konawaruk river area, for which it is proposed to purchase and install a new dredge, as well as the required power equipment. This second stage is estimated to cost £400,000.

To assist the company, the Colonial Development Corporation have again agreed to loan further sums up to £472,742 on the security of a new debenture carrying interest at the rate of 6 per cent per annum, redeemable over ten years, and ranking *pari passu* with existing debentures charged against the loan advanced by the Corporation under the 1948 agreement. A further sum of £89,258 will be raised by the company by the issue at par of 892,575 Ordinary shares of 2s. each, bringing the total of fresh funds raised to £562,000—the amount estimated to complete the second stage of the scheme.

One half of these shares will be allotted to the Colonial Development Corporation, together with any of the remaining 446,288 shares not subscribed for by the holders of the existing "A" shares. On completion of these arrangements, the total issued loan and share capital of the Company will amount to £972,742, made up of £294,629 share capital and £678,113 loan capital.

The third stage of the development programme is concerned with carrying out prospecting in other areas, especially in the Lower Konawaruk, Mowassie, Tiger and Siparuni areas, and it is also hoped to develop the Upper Potaro river area, though this, of course, depends on prospecting results. In this connection arrangements have been made for a programme of drilling in the Lower Konawaruk and Mowassie areas and a start has been made with the drilling in Tiger Creek, but insufficient information is, as yet, available to estimate the value of these properties.

For the year ended July 31, 1950, revenue declined to £74,518 against £83,771, largely due to the dredge working through ground which yielded only 2.51 grains gold per cu. yd. compared with 3.66 previously, and also to a slightly lower yardage dredged. Depreciation provisions nearly doubled and after providing for all expenses net profit worked out at £9,395. After providing for taxation and bringing in the carry forward from last year the total amount available was £10,689, from which the payment of a dividend of 4 per cent (same) absorbed net £4,518, a balance of £6,171 being carried forward.

For the six months ending January 31, 1951, yardage dredged on the Mahdia totalled 395,773 yielding 3,704 f.oz.

# Indian Gold Mines

THE final phase in connection with the removal to India of the seat of management of the mines of the Kolar Goldfield took place last year. It was on November 24 that resolutions were passed at meetings convened to approve both the reports of the four British companies and also the draft agreement for the sale of the undertakings and assets to the new Indian rupee companies. They are all incorporated in the State of Mysore and bear the titles of The Champion Reef Gold Mines of India (KGF) Ltd., The Mysore Gold Mining Company (KGF) Ltd., Nundydroog Mines (KGF) Ltd. and The Ooregum Gold Mining Company of India (KGF) Ltd.

The sales became effective on April 1, and British vendor companies will be allotted shares in the Indian companies, as follows: Champion Reef 433,333 shares of Rs.10 each, equivalent to its issued capital of £325,000; Nundydroog Mines 377,333 shares of Rs.10, equivalent to its issued capital of £283,000; Ooregum Gold 321,029 Ordinary shares of Rs.10 each and 160,000 ten per cent non-cumulative participating Preference of Rs.10 each, equivalent to its issued capital of £240,772 in Ordinary units and £120,000 in ten per cent non-cumulative Preference; and Mysore Gold 813,333 shares of Rs.10 each, equivalent to its issued capital of £610,000.

The four British companies will thus become holding companies and their shares will continue to be quoted on the London Stock Exchange. Messrs. John Taylor & Sons (India) Ltd., act as managers in India, while Messrs. John Taylor & Sons continue to act as consulting engineers in London.

Under the new arrangement with the Mysore Government involving a variation of the leases, the companies contribute 75 per cent of net surpluses to the Government, such net surpluses being arrived at after deduction of royalties, income tax, a special provision for capital development amounting to 15 per cent of revenue expenses reserved for depreciation and capital expenditure and sums of up to six per cent on the subscribed capital. This six per cent on the subscribed capital is intended to provide a minimum dividend before arriving at the net surplus in which the Mysore Government shares. There is a proviso that if the dividend does not exceed six per cent and the net surplus does not exceed six per cent of the paid up capital, then the net surplus will be divided equally between the Government and the companies, the latter's obligation for additional royalty under the leases being remitted. Further, if the dividend does not exceed six per cent but the net surplus does, the companies' share of such net surplus will not be less than three per cent of subscribed capital.

This new arrangement was accepted by the companies in lieu of the gold duty, at one time in force, and which threatened the very existence of the mines. Their life prospects have been materially improved both by the abolition of the gold duty and the provision made for capital expenditure which will enable the mines to develop in a normal manner.

As a result of changes in the companies' liability to taxation, the repeal of the Gold Duty Act and the variation of the terms of the leases from the Mysore Government, it was necessary to divide the companies' accounts for the year 1949 into two parts; the first period from January 1 to May 5; and the second period from May 6 to December 31, 1949. The ensuing accounting period covers fifteen months from January 1, 1950 to March 31, 1951. All four British vendor companies have paid dividends out of their undistributed profits up to May 5, 1949 —the date on which management was transferred to India.

There have been some useful finds of new ore which will help to strengthen the reserves greatly depleted by enforced limitation of development work in recent years. Unfortunately, however, electric power cuts have interfered with operations and labour unrest has manifested itself resulting in a loss of about two months' work on all four mines during 1949.

## THE MYSORE GOLD MINING CO., LTD.

The oldest mine of the group—Mysore Gold—has been in existence for 70 years. Mysore became one of the richest gold properties in the world but with greater depths to which mining was carried and rising costs, the excellent results of the past could not be maintained.

During 1949 ore milled was slightly down at 155,520 tons against 168,720 tons the previous year and the production of gold 51,226 ozs compared with 54,629 oz. The revenue, after gold duty, amounted to £1,092,697 compared with £927,082.

Profit for the first period, January 1 to May 5, 1949, was £628, to which was added £39,252 over-provision for taxation and an amount of £55,623 special reserve, while for the second period the profit was £34,960, making with the forward balance a total for the year of £144,205. Dividends of 6½ per cent were paid together with a grade bonus of 9 per cent tax free.

There was a small decrease in the ore reserves, which at December 31, 1949, figured at 285,000 tons averaging 11.91 dwt.

During 1950, the tonnage milled was 165,188, producing 54,221 oz. gold. An interim dividend of 15 per cent has been paid for the period ending March 31, 1951.

## NUNDYDROOG MINES LTD.

The Nundydroog Mines are engaged in a deep-level layout scheme, which is proceeding satisfactorily. There was a reduction in the tonnage milled during 1949, the total being 129,153 as against 148,203 tons. Gold produced, including that from old tailings, was 36,917 oz. against 44,133 oz. Revenue after deduction of gold duty amounted to £786,324 compared with the previous year's figure of £751,061.

For the first period to May 5, 1949, a loss was incurred after transferring £1,978 for grade bonus to special reserve of £11,967. Over-provision for taxation brought in £16,118 and special reserve £23,240, making with the forward balance a total of £59,299. A dividend of 2½ per cent tax free was paid together with a grade bonus of 8 per cent tax free. Revenue for the second period was transferred to a reserve for Indian taxation, depreciation and development.

There was a setback in ore reserves, the estimated total at December 31 being 225,003 tons of an average grade of 10.53 dwt. This represented a decrease of 15,717 tons, but an increase in grade as compared with the previous year.

During 1950, development of the newly discovered Western reefs proceeded at an increasing rate and most encouraging results were obtained. The potentialities of these reefs are becoming clearer as development work proceeds, but already it can be said that what amounts to a new mine has been discovered. Considerable expenditure will, however, be required to bring these reefs into production.

Production last year showed an improvement; 164,498 tons of ore were milled, which yielded 43,869 oz. gold. Total gold production, including dump re-treatment, totalled 45,182 oz.

## THE CHAMPION REEF GOLD MINES OF INDIA LTD.

Owing to the magnitude and richness of the Glen ore shoot, the Champion Reef's record has been an outstanding one. During last year an interesting discovery was made in the 93rd level, south of Osborne shaft, and well to the south of the Glen ore shoot. The drive has encountered what appears to be a new ore shoot and for 100 ft. the quartz averages 61 in. width and 18 dwt. value.

During 1950, the mill dealt with 135,800 tons for a production of 64,833 oz. gold. These figures represent both the highest milling rate and yield since 1943.

The mine's milling tonnage during 1949 was lower at 99,240 tons against 105,070 tons in 1948, for a production of 51,022 oz. gold (against 52,604 oz.), which yielded a net revenue, after paying gold duty, of £1,011,344 compared with £668,611.

For the first period January 1 to May 5, there was a profit of £8,241, to which was added £23,649 over-provision for taxation from previous year and £12,046, balance of grade bonus transferred back from special reserve, making with the balance forward, £54,776. For the second period to end December, the profit was £33,639, making altogether a total for the year of £98,415. Dividends of 11½ per cent and cash grade bonus of 3½ per cent were paid.

Ore reserves at December 31, 1949, showed a slight decrease at 525,130 tons, value 11.85 dwt. against 548,834 tons of 12.11 dwt.

## THE OOREGUM GOLD MINING CO. OF INDIA LTD.

Although progress with the plans for joint working of Champion Reef and Ooregum has been slow, work is expected to be completed this year. The plan is for ore from Ooregum deep levels to be hoisted up Champion Reef Gifford shaft and treated in the reorganized Champion Reef mill, which is being adapted to treat the combined tonnages.

During 1949, Ooregum's milling was affected by a severe rockburst. The tonnage crushed was 65,209 or just over two-thirds of the previous year's figure of 97,118 tons. Gold produced amounted to 21,737 oz. against 28,618 oz. and revenue, after gold duty, came to £459,283 compared with £489,416.

Profit for the first period was £4,555, to which was added £24,230 over-provision for taxation and an amount of £9,737 special reserve, making with the forward balance, £47,302 for the year. There was no net surplus for the second period. A dividend of 5½ per cent tax free was paid on the Preference together with a grade bonus of 2½ per cent tax free on both Preference and Ordinary.

Ore reserves at December 31, 1949, were 148,004 tons of a value of 9.08 dwt. compared with 147,614 tons value 8.61 dwt.

Owing to the outbreak of a fire in the latter part of 1949, which continued until February, 1950, and the completion of repairs to auxiliary shaft following rockburst operations in 1950, operations in 1950 did not return to normal until May. Some 89,650 tons were milled last year, yielding 25,257 oz.

# Paringa Mining & Exploration Co., Ltd.

IT is just over 65 years since the Kalgoorlie goldfields of Western Australia first aroused world wide interest, and about forty years since the original Paringa Company was formed.

In common with other mines on the Golden Mile, Western Australia, Paringa Mining & Exploration has had in recent years to contend with rising working costs, coupled with labour shortages and State enactments restricting working hours. In addition to these familiar difficulties the milling grade from the higher levels in the mine has been declining over the past few years, with the result that considerable importance attaches to the development work currently being undertaken at lower levels. Nevertheless, Paringa has in the past proved itself to be a profitable gold producer—and a good dividend payer.

The property is well positioned towards the north-western end of the Golden Mile and consists of five mines—the Paringa, Croesus South, Block 45, North Kalgurli Central and Brownhill Extended—a composite group, which has justified the attention given it. The main lease, that of the Paringa Mine, has had the most work done on it and has been in profitable production for some twelve years.

## EXPLORATORY WORK

Exploratory work from Paringa's South Main shaft, which has attained a depth of 1,325 ft., is being pressed forward. Encouraging values have been located on Block 45 Mine, and the Federal shaft is being deepened to the 800 ft. level.

The tonnage milled during the year to August 31, 1950, was 96,506 and the grade of ore 4.20 dwt. Revenue from gold proceeds amounted to £220,807, with mining and milling costs of £213,855. It has been provisionally estimated that after charging £34,300 for expenditure on mine development and allowing for plant depreciation, London expenses, etc., there will be a loss of around £35,000 on the year.

The computation last made of ore reserves put the figure at 124,933 l.tons, of an average grade of 4.90 dwt. per ton.

During the past year the mine has been placed under new technical management and an intensive programme of geological investigation and underground diamond drilling is proceeding to test portions of the mine where promising values have recently been disclosed in boreholes.

Meanwhile, in the face of steadily rising costs and declining yield from the low grade ore at present available, the board wisely decided in January to suspend milling operations so as to obviate the losses that were being incurred on current production, and to concentrate available resources on underground development.

Thus, while the mill and other surface operations are being halted, underground development is continuing energetically, and resumption of milling operations will depend upon results of the present programme of development work.

## MOUNT CHARLOTTE; MARITANA AREAS

By arrangement with Mount Charlotte (Kalgoorlie) Gold Mines trial crushings have been proceeding from a surface dump of approximately 25,000 tons of development rock from the Mount Charlotte mine. In the event of the metallurgical tests proving successful, this dump will be treated at the Paringa mill so as to keep it in operation. It is, however, possible that the Mount Charlotte ore may require a different flow sheet, which would necessitate some redesign of the mill layout and the introduction of additional plant.

Paringa Mining has a substantial interest in the Mount Charlotte leases which are situated to the north of the boundary of the Kalgoorlie townsite.

The company also retains its 70 per cent interest in the Maritana area, which adjoins the Mount Charlotte Mines. Nineteen boreholes have been sunk on the property to depths varying down to 1,000 ft., and on the southern extension of the lode channel promising values have been disclosed. Other bores have been drilled to determine further extensions of this ore body, and in search of new lodes.

# Boulder Perseverance Ltd.

THE Mine which this Company operates is situated almost in the centre of the Golden Mile at Fimiston near Kalgoorlie. The lease occupies only 24 acres and was among the richest gold-bearing areas ever known, being a complicated network of gold-bearing lodes and offshoots, many of which were extremely rich in the upper levels. The Company, originally formed in 1895 under the title Great Boulder Perseverance Gold Mining Co. Ltd., had a meteoric career, but finally went into liquidation in 1917, the Mine being worked by tributers during the liquidation period. In 1923, the late Mr. C. F. Bell, who was acting as liquidator, formed the present Company which from the start adopted an active policy of reconditioning of mine and plant and of scientific development of the Mine and treatment methods. The original capital of Boulder Perseverance Ltd. was £125,000, increased in 1935 to £150,000 and again in 1937 to £225,000 and reduced in 1945 to the present figure of £224,820.

The ore, which is sulpho-telluride, is refractory and the Company was one of the pioneers in wet-treatment, involving pre-cyanidation and flotation. It owns 67.7 per cent of the Kalgurli Ore Treatment Co., which is a non-profit enterprise, treating ore from Boulder Perseverance, North Kalgurli and Enterprise Mines. Boulder Perseverance owns 65.2 per cent of the share capital of Kalgoorlie Enterprise Mines Ltd., which operates the Enterprise Mine.

The policy followed since the formation of the present Company has been to plough back profits into the Mine and the true capital employed in Boulder Perseverance Ltd. is well over £1,000,000. Dividends have been paid consistently since the inception, with the exception of two years only, 1927 and 1930, when conditions were extremely adverse and the re-organization was not completed.

During the second World War operations were carried on under great difficulties but still profitably and a large amount of reconditioning was necessary after the cessation of hostilities. After both World Wars a period of inflation set in which the British and Australian Governments attempted to obscure by compulsory acquisition of gold at a pre-war price. This policy brought the Kalgoorlie field close to ruin on both occasions, and while the devaluation of the British pound sterling in September, 1949 gave temporary relief in an increase of the price of gold to £15 9s. 10d. per oz. in Australian currency, this increase has been largely absorbed by a tremendous acceleration of inflation in Australia during 1950 and 1951.

Owing to Government supported and subsidized industries paying higher salaries and wages, labour and staff problems have become increasingly acute. Kalgoorlie has not the amenities nor climate of the coastal belt, and when there are posts available in these latter areas, the drift to the cities continues. These factors affecting costs and manpower are not capable of being off-set by further technical improvements and economies which have been taken to a very high degree of efficiency.

At March 31, 1950 the ore reserves were estimated at 450,300 l.tons, averaging 4.8 dwts. The working results for the previous 15 months were 158,975 l.tons mined and treated of an average grade of 4.99 dwts. Profit after all charges £83,172. Dividend for the 15 months 20 per cent.

British taxation for the period amounted to 51 per cent of the profits and although gold-mining profits are exempt from Australian Income Tax, this exemption is of little or no value to companies registered in Great Britain.

The Enterprise Mine being only brought into production just prior to the war has suffered to a greater extent than Perseverance Mine, and has been unable to keep up its tonnage owing to shortage of labour.

The prospects for gold-mining in Australia are obscured by political issues centering round the desire of the International Monetary Fund to continue to keep up the fiction of a stable United States dollar. Inflation in the United States, Great Britain and Australia continues at an increasing rate, therefore costs continue to rise. In Australia, Arbitration Court awards are enforced making large increase of wages with shorter hours worked. The increases are often termed prosperity allowances, and have no relation to the cost of living increases which are awarded quarterly. Gold has increased in price by 73 per cent above the price obtained in 1938. Cost increases passed this percentage in 1948 and the free market for gold still has not been granted. The factors governing the future of the industry are therefore not capable of being dealt with by ordinary business foresight and calculation. No technical advances can cope with the position and while the Company is up-to-date and efficient, until gold is treated as all other metals and commodities are treated, the future results must be obscure, particularly for mines which are operating on 5 dwt. ore or less.

# Sons of Gwalia, Ltd.

**General Managers: BEWICK, MOREING & Co.**

THE Jubilee which Australia is celebrating to mark the 50 years since the six colonies were knit into a Dominion, coincides with 50 years' milling operations by Sons of Gwalia. This old time producer, situated on the North Coolgardie goldfield has given a good account of itself, and promises to outlive many newer mines. It has had its setbacks and there was a break in progress resulting from a disastrous fire in 1921 but with the help of the West Australian Government, operations were restarted and the mine's prosperous career was resumed. Development work proved successful, milling results were good and distributions to shareholders renewed. This satisfactory state continued until about 1947, when the severity of post-war conditions hampered operations; the war-depleted labour supply was hard to make up, and costs were spiralling upwards. The labour position was, however, eased in 1948 by the recruitment of Italian miners and displaced persons from the Baltic States, with a consequently beneficial effect both on tonnage mined and more recently on the amount of development work carried out.

Milling operations last year again showed improvement, and 101,112 tons of ore were treated for a yield of 25,628 oz. gold, equivalent to an average grade of 5.07 dwt. per ton, the corresponding figures for 1949 being 91,399 tons treated yielding 23,572 oz., (5.1 dwt. per ton) and for 1948 67,289 tons, yielding 18,139 oz. (5.4 dwt. per ton).

## FINANCIAL RESULTS

Financially the year 1949 was a much less difficult one for the mine—a profit of £27,909 being recorded against a loss the previous year of some £16,000. This enabled a re-entry to be made into the dividend list with a payment of 10 per cent (1s. per share) payments for 1948 and 1947 having been nil and 12½ per cent respectively. With the sum of £15,890 brought in, the available balance was £43,799. Taxation called for £8,000, and after making provision for amount written off investment and the dividend, and taking into account sundry revenue, the balance carried forward was £21,158.

Underground work during 1949 was concerned mainly with opening up the Middle Lens ore body on No. 32 level and winzing on the South-West Branch lode from No. 31 level. A crosscut put out intersected values in the hanging wall of the Main Lode on No. 29 level, and this new ore body has been developed giving satisfactory results. It proved to have a width of 21 ft. and has been driven on north and south, the north drive giving an average of 6.0 dwt. over 96 in. and the south, 8.3 dwt. over about the same width. Stripping suggested that the ore body was oval in section and diamond drilling proved its upward and downward continuation.

Although work on the property has been energetically pursued, arrears of development, maintenance and other work underground caused by the war have not been fully overtaken. With a better complement of labour, hopes in this direction show promise of realization. Ore reserves continue to build up and their last computation was 602,224 tons, the value being 5.55 dwt. This is equal to about six years' mill feed.

## COSTS OFFSETTING DEVALUATION

The mine has, since devaluation, been receiving the higher value of £A.15 10s. per f.oz. for its gold against the old price of £A.10 15s. per f.oz. Wages and prices, however, have continued to rise and countered to a big extent, the benefits of this enhanced price. Continual vigilance has had to be shown and new methods introduced both saving labour and improving plant efficiency. It was for these reasons that the Merrill Crowe process and the filtration plant were modernized. The reduction plant itself is old but it has run satisfactorily—a tribute to the skill and efficiency of the maintenance staff. Oliver filters have been installed to replace the Cassel filter and promise to show quite substantial savings.

For the time being the rumoured upward revaluation of the Australian £ has receded into the background, but it is an issue which is always likely to be re-opened to the detriment of Australian gold producers. Provided, however, this does not come about and in the absence of other untoward incidents, the outlook for the mine can be considered satisfactory. It is a low grade property but its technical position is very healthy and the improvements which have been introduced these last few years should assure a continuity of operations.

# North Kalgurli (1912) Ltd.

AFTER passing through many vicissitudes in its early days, the North Kalgurli, is fully justifying the confidence shown in it. The property, which consists of several leases, is well positioned on the north-west of the Golden Mile, having for its neighbours the South Kalgurli and the Paringa properties. Although the authorized capital is £250,000 only £110,000 has been issued in 2s. shares.

A very satisfactory expansion of operations has taken place since the restriction of work imposed by the war. Not only has development and crushing expanded but more scope has been given to the enterprise by the acquisition of adjoining leases which had previously separated the Company's Croesus group from the Kalgurli group. The areas acquired cover the probable southern and downward extensions of the ore bodies which have been worked in the Croesus group of leases.

## IMPROVED YIELD

During the year to January 3, 1950, the tonnage of ore treated from development and stoping was 232,393 compared with 217,541 tons the previous year. The tonnage was, as usual, treated in part by the Kalgurli Ore Treatment Co.'s plant (owned jointly with Boulder Perseverance) and partly by Croesus Proprietary Treatment Co.'s plant, which is owned jointly with South Kalgurli Consolidated. The yield of gold was 63,264 f.oz., against 57,906 the previous year, while the head value was slightly better being 5.865 dwt. per ton compared with 5.83 dwt. The tonnage dealt with came in the main from the North Kalgurli lease, augmented by supplies from the Birthday Lease and Birthday South Lease, with smaller quantities from other areas.

The net revenue per ton rose to 55s. 8d. against 46s. but working costs were higher at 38s. 5d. as against only 33s. 4d. the previous year. The profit per ton was, however, well up at 17s. 3d., whereas in 1948 it was only 12s. 8d.

Notwithstanding increased production, operating costs in all sections were higher than for the previous year. They reflected increased wage rates and higher prices of materials used in operations. The shorter working week, shortage of competent labour and high labour turnover, all contributed to increased operating costs. This again resulted in a further increase in Australian expenditure which amounted to £434,703 as against £362,714.

The net revenue from mining amounted to £202,050 (as against £131,816) which together with the balance brought forward from the previous year, provided a total of £222,448 compared with £141,008 the previous year.

After allowing £3,881 for plant, machinery and buildings as well as for London expenditure and sundry small revenue items, the net profit to be appropriated amounted to £199,794 compared with £130,959 in the previous year. Consequently a larger amount was called for in taxation—£112,050 as against £72,750. The material improvement in revenue allowed the dividend to be stepped up from 1s. 6d. to 2s. +3d. bonus per 2s. share.

## ORE RESERVES AND DEVELOPMENTS

During 1949 the mine's ore reserves were again built up although the development footage was slightly lower than was accomplished the previous year—9,245 ft. At January 4, 1950, positive ore reserves stood at 1,533,438 tons averaging 5.87 dwt. with further probable reserves amounting to 806,060 tons of 5.15 dwt., making a total of 2,359,498 tons averaging 5.62 dwt. The increase in reserves over the previous year amounted to 225,881 tons.

Diamond drilling continued during the year and as a result, points for development over a number of years were obtained. Extensions of the lode formation were located and the occurence of ore encouraged the belief that the lodes are highly persistent in character. This was particularly manifest with the drilling on No. 20 level, Kalgurli Shaft. Nos. 16 and 17 levels gave further encouraging intersections in the vicinity of existing working and developments on these levels were the direct result of diamond drilling intersections.

Work in connection with the rehabilitation of the Croesus section has been proceeding. Cleaning up has gone forward at the Croesus shaft of the large amount of material washed into the mine during the 1948 floods and the damage to timbering and ore passes repaired.

During 1950, further improvement was seen in the tonnage of ore treated 244,067 tons being crushed for a slightly reduced yield of 59,063 oz. Following on the encouraging drilling results referred to above, work in connection with the sinking and equipment of a new main shaft has proceeded, and when this is brought into commission, it is estimated that it will have a haulage capacity of from 25,000 to 30,000 tons a month. Costs have been estimated at up to £A.200,000, spread over a period of two years, the time required to complete the shaft.

# The Consolidated Zinc Corporation, Ltd.

## Group's Comprehensive Spread of Interests

FORMED in 1949 with an authorized capital of £20,000,000, £11,024,573 of which are issued, The Consolidated Zinc Corporation amalgamates the interests of the Zinc Corporation and Imperial Smelting Corporation two companies which for many years have been closely associated in the development of the non-ferrous metal production of the British Commonwealth.

The principal activities carried on through the subsidiary and associated companies are the mining of lead-silver-zinc ore in the Broken Hill district of New South Wales, Australia, the production of market lead at the Port Pirie smelter in South Australia and of zinc metal, sulphuric acid and ancillary products at various works in the United Kingdom.

### OUTPUT FROM ZINC CORPORATION AND N.B.H.

The group holdings include the entire capital of the Zinc Corporation Ltd. and 32 per cent of the capital of New Broken Hill Consolidated Ltd. which companies' mining leases at Broken Hill, New South Wales, cover part of the largest single lead-silver-zinc ore body in the world unique also for its continuity and relative consistency in metal content. In the leases of the Zinc Corporation which have already produced over 12,000,000 tons of ore, there were at the end of 1950 over 5,000,000 tons of fully developed ore reserves, and development beyond the limits of these reserves continues to open up new ore both laterally and in depth. The New Broken Hill Consolidated mine which adjoins that of the Zinc Corporation is opening up the continuation of the main ore bodies south of the Zinc Corporation leases. Ore is being won from the New Broken Hill Consolidated mine at an increasing rate each year as development proceeds, and although no estimate of the tonnage of fully developed ore reserves has yet been published, results indicate that the ore bodies continue into the New Broken Hill Consolidated leases undiminished in strength and grade.

While the New Broken Hill Consolidated mine is being equipped with its own shafts and surface works all its production is being hauled through the Zinc Corporation's main shaft and treated in that company's mill. There is also an arrangement whereby, in consideration for New Broken Hill Consolidated having deferred its own programme of development in the war years by agreeing to concentrate labour on producing the maximum tonnage from the Zinc Corporation's mine, a proportion of the present output of the Zinc Corporation is sold to New Broken Hill Consolidated. The following table shows the combined tonnages of ore treated and the production of lead and zinc concentrates during 1950:

| | |
|---|---|
| Ore Treated | 599,010 tons |
| Lead Concentrates Produced | 104,907 tons |
| Assaying, lead | 76.6 per cent |
| Assaying, silver | 15.2 oz. per ton |
| Zinc Concentrates Produced | 122,158 tons |
| Assaying, zinc | 52.3 per cent |

The combined output of the Zinc Corporation and New Broken Hill Consolidated represents more than half the total production of recoverable lead and zinc from the Broken Hill field.

At the end of 1949 the fully developed ore reserves of the Zinc Corporation were:

| | Tons | Lead per cent | Silver oz. per ton | Zinc per cent |
|---|---|---|---|---|
| Lead Lode ... | 4,900,000 | 15.4 | 3.2 | 10.7 |
| Zinc Lode ... | 450,000 | 6.9 | 1.4 | 17.0 |

### OTHER CONSOLIDATED ZINC INTERESTS IN AUSTRALIA

The mines in the Broken Hill district derive their electricity and compressed air supplies principally from the central power station of the Western New South Wales Electric Power Pty., Ltd., in which company the C.Z.C. group holds a 32 per cent interest. This central plant has a collective capacity of some 48,000 h.p. In addition, the group owns the whole issued capital of the Southern Power Corporation Pty., Ltd. which is erecting at Broken Hill an auxiliary power station with a rated capacity of over 13,000 h.p. to supply the additional electric power and compresed air requirements of the Zinc Corporation and New Broken Hill Consolidated.

A considerable proportion of the supplies of timber for the mines of the group is assured through the wholly owned Heron's Creek Timber Mills Pty. which owns freehold and leasehold forest areas and saw mills in New South Wales.

The whole of the lead concentrates produced by the mines in the Broken Hill field are treated at the lead smelter at Port Pirie, South Australia, of the Broken Hill Associated Smelters Pty., Ltd. in which the group owns a 50 per cent interest. This smelter, which has a capacity in excess of 200,000 tons of refined lead per annum is the largest individual producer in the world of high grade refined lead.

Other activities of the group in Australia include, through Enterprise Exploration Co., Pty., the provision of geological and geophysical exploration services not only for the Zinc Corporation and New Broken Hill Consolidated but also, on contract, for third parties; through Titanium and Zirconium Industries Pty., the investigation and exploitation of a large alluvial area of mineral bearing sands on Stradbroke Island lying off the coast of South Queensland; and, through Sulphide Corporation Pty. the production of cement, sulphuric acid and superphosphate at Cockle Creek, New South Wales.

### INTERESTS IN THE U.K.

The principal operations of the group in the United Kingdom are controlled through its holding of the whole of the ordinary shares of Imperial Smelting Corporation which through its subsidiaries produces about 30 per cent of the zinc, and nearly 10 per cent of the sulphuric acid requirements of the United Kingdom. The zinc concentrates from the group's mines at Broken Hill form the principal raw material for the zinc smelting works at Avonmouth and Swansea, and for the sulphuric acid plants there and at Seaton Carew and Newport. A number of ancillary products are also produced at Avonmouth, including cadmium, metallic arsenic, hydrofluoric acid and its related fluorides and fluorine products, vanadium catalyst and the well-known "Cuprinol" range of timber and textile preservatives, while another plant at Bloxwich produces Mazak alloys and zinc dust.

Mines operated by the group in this country provide barytes for the lithopone works at Widnes, and fluorspar for the Avonmouth plant. Zinc exide is made at Luton and Burry Port.

The group is also interested in the production of aluminium sulphate, aluminium fluoride, titanium pigments and agricultural fertilisers through its holdings in Aluminium Sulphate Ltd., British Titan Products Ltd. and Fisons Ltd.

### FIRST YEAR'S ACCOUNTS

The first accounts of The Consolidated Zinc Corporation Ltd., which cover the period February 2 to December 31, 1949, showed a consolidated profit of £3,453,429. U.K. taxation called for £2,077,727, or 60 per cent of the consolidated profit, a very heavy burden, which left a sum of £1,375,702. After deducting the interest of minority shareholders in subsidiary companies, £148,583, and that proportion of profits relating to the period prior to the date of acquisition of stock and shares in The Zinc Corporation, Ltd., of £288,547, there remained a net profit of £938,572. An amount of £262,074 was transferred to General Reserve, and £43,023 allocated to meet the Preference dividend. The Ordinary dividends (7½d. interim and 1s. 10½d. final) making a total of 2s. 6d. per share, called for £450,172, leaving a balance to be carried forward of £183,303. The total sum retained in the group out of profits earned during the year was £733,924, comprising amounts transferred to Capital and Revenue Reserves, and the balance of undistributed profits carried forward. An interim dividend on the Ordinary shares of 7½d. (3.2 per cent) in respect of 1950 was paid on January 1, 1951.

The book value of the fixed assets, £10,122,619, is a considerable understatement of current worth. The figure of £4,225,000 at which mining properties appear in the balance sheet is well below the valuation made by consulting engineers. Similarly, the valuation placed on buildings, plant and equipment is stated to be approximately £3,000,000 in excess of the book figure of £5,541,391. Current assets less current liabilities amounted to £5,413,611.

### FUTURE PLANS

Immediate future plans envisage a widening of the group's activities, and in the consideration of the technical problems thus involved the maximum benefit is assured by a policy of free and full exchange of information between the operating staffs of the various units.

Given reasonably stable conditions at home and in Australia over the next few critical years, there should be a gradual increase in the scale of the Corporation's mining activities with a corresponding expansion of its manufacturing operations particularly so in relation to the production of zinc and ancillary products in Australia.

# New Broken Hill Consolidated Ltd.

FORMED IN 1936 to work on the line of the famous Broken Hill lead-silver-zinc lode in New South Wales, Australia, New Broken Hill Consolidated Limited acquired leases adjacent to, and south of, the Zinc Corporation's boundary extending for a strike distance of approximately three and a half miles and covering some 2,016 acres.

Before the development work was properly under way the war intervened and the New Broken Hill company agreed to the concentration of the available labour in the mine of its associate, the Zinc Corporation, in order to secure the maximum production of base metals for armament purposes. Despite this setback in the original plans, production of concentrates started in 1945, and has continued on an increasing scale, the ore being meantime hauled through Zinc Corporation's main shaft and treated in the mill belonging to that company which, in addition, sells some of its present output to the New Broken Hill company.

## TWO TYPES OF MINERALIZATION

Where the ore bodies—which are anticipated in cross section—pitch southwards from the Zinc Corporation leases into those of New Broken Hill Consolidated, there are two types of mineralization. Firstly, high in the stratigraphic sequence are the so-called "zinc ore bodies" typical values in which are 5.5 per cent lead, 1 oz. silver and 13 per cent zinc; and, secondly, lower in the sequence come the "lead ore bodies" with values of the order of 15 per cent lead, 3.5 oz. silver and 9 per cent zinc. The zinc ore bodies therefore occur in the higher levels of the New Broken Hill company's ground while the lead ore bodies enter it below No. 16 level. Although, of necessity, most of the production so far has come from the more readily accessible—though less rich—zinc ore bodies, the development of the high-grade lead ore bodies in the lower levels has been pushed on with all possible speed. Recently drilling on No. 19 level (2,760 ft. in depth) at a point about 150 ft. south of the boundary with the Zinc Corporation disclosed a total ore width of 520 ft. averaging 17.2 per cent lead, 4.7 oz. silver and 12.9 per cent zinc, thus proving in the New Broken Hill Consolidated ground the extension of the massive rich ore bodies being worked by the Zinc Corporation.

## EQUIPPING THE MINE

The work of equipping the property with its own shafts and surface works, including a concentrating mill, has proceeded steadily but shortages, mainly structural steel and lack of adequate labour, have to some extent hindered operations both on the surface and underground. About a thousand feet south of its boundary with the Zinc Corporation are the two New Broken Hill Consolidated main surface openings; the 13½ ft. diameter haulage shaft which has reached its planned depth of 3,249 ft. and will soon be in use to No. 22 level, a depth of 3,160 ft. from the surface; and the 20 ft. diameter service shaft which is expected to reach the same depth in the latter part of this year. These shafts will be served by three electric winders, two of 2,600 h.p. and one—for a runabout cage—of 900 h.p.

Power for these winders and the other works including the concentrating mill will be drawn partly from the central plant of the Western New South Wales Electric Power Pty. Ltd.—which serves all the mines in the Broken Hill area—and partly from a plant now being installed by Southern Power Corporation Pty. Ltd., an associated company of Zinc Corporation and New Broken Hill Consolidated. The initial installation at this new power station will consist of four 2,370 kW diesel-driven electric generating sets and three 4,140 cu. ft. per minute electric motor driven air compressors.

At the boundary of the Zinc Corporation and New Broken Hill Consolidated leases, a 20 ft. diameter air-shaft is being sunk to augment the air supply to the mines of both companies when the need exceeds the capacity of the present ventilation openings. The high geothermic gradient of the Broken Hill field makes the provision of adequate ventilation of special importance. The rock temperature at a depth of 2,600 ft. at Broken Hill is approximately 100°F. giving conditions comparable with those obtaining at a depth of about 8,500 ft. on the Rand in South Africa.

Many of the major items of the equipment and construction programme should be completed in 1951; and by 1952, subject to no unforeseen delays, the annual output should be in excess of 200,000 tons and still increasing.

## MILLING RECORD

The following table shows the tonnage and grade of ore produced from the company's own leases during the past five years, together with the production of lead and zinc concentrates:

| | 1946 | 1947 | 1948 | 1949 | 1950 |
|---|---|---|---|---|---|
| Ore Treated, tons ..... | 41,723 | 62,367 | 103,578 | 175,150 | 165,685 |
| Grade, per cent lead | 7.6 | 8.7 | 9.0 | 8.2 | 9.1 |
| Grade, ounces silver | 1.6 | 1.9 | 1.9 | 1.8 | 2.1 |
| Grade, per cent zinc | 11.3 | 13.0 | 12.6 | 12.6 | 12.9 |
| Lead Concentrates, tons | 3,851 | 6,654 | 11,424 | 17,810 | 18,671 |
| Grade, per cent lead | 76.7 | 77.0 | 76.8 | 76.3 | 76.6 |
| Grade, ounces silver | 14.9 | 15.5 | 15.2 | 15.4 | 16.6 |
| Zinc Concentrates, tons | 8,221 | 14,584 | 23,175 | 38,830 | 38,137 |
| Grade, per cent zinc | 52.2 | 51.8 | 52.3 | 52.5 | 52.3 |

The above figures were supplemented by purchases of ore from Zinc Corporation under the terms of the Sale of Ore Agreement; and the following table shows the total production for account of New Broken Hill Consolidated during these years:

| | 1946 | 1947 | 1948 | 1949 | 1950 |
|---|---|---|---|---|---|
| Total Ore Treated, tons | 86,527 | 107,772 | 154,102 | 224,033 | 209,017 |
| Grade, per cent lead | 10.9 | 11.4 | 11.1 | 9.7 | 10.5 |
| Grade, ounces silver | 2.5 | 2.5 | 2.4 | 2.1 | 2.3 |
| Grade, per cent zinc | 11.2 | 12.4 | 12.2 | 12.4 | 12.6 |
| Total Lead Concentrates, tons ..... | 11,782 | 15,318 | 21,245 | 27,132 | 27,295 |
| Grade, per cent lead | 76.9 | 77.0 | 76.8 | 76.3 | 76.6 |
| Grade, ounces silver | 16.2 | 15.8 | 15.6 | 15.4 | 16.1 |
| Total Zinc Concentrates, tons ..... | 16,684 | 23,664 | 33,096 | 48,439 | 46,539 |
| Grade, per cent zinc | 52.3 | 51.8 | 52.3 | 52.5 | 52.3 |

## MINERS' WELFARE

Much is wisely being done by the company in the way of providing for the welfare and comfort of its employees. In association with the Zinc Corporation it assists employees to purchase or build their own houses and equip them. For those who have their homes and gardens already established, many amenities of a recreational and cultural nature are provided, some of which are financed jointly by New Broken Hill Consolidated and Zinc Corporation and some in association with all the other mining companies in Broken Hill.

There is also in operation a Mine Employees Pension Fund which provides pensions for daily paid workers on retirement at age 62. A dental clinic for employees and their families has also been established by the mining companies, who are also principal contributors to the maintenance of the large modern air-conditioned hospital.

## EARNINGS

The authorized capital of New Broken Hill Consolidated is £1,250,000 in 5,000,000 shares of 5s. each, of which 4,482,369 shares, representing £1,120,592 5s. have been issued. Of these, 781,537 were issued fully paid in satisfaction of the purchase price of the undertaking, and 1,250,000 were issued for cash at par. In 1946, a total of 1,354,358 were subscribed for cash at 15s. per share; and in 1948, a further 1,096,474 were subscribed for cash at 30s. per share. Net profits after providing for depreciation and taxation have increased from £81,057 in 1946 to £384,014 in 1949. A first dividend of 1s. per share was distributed in respect of the year 1947, followed by a similar amount for 1948, and 1s. 6d. for 1949, and an interim dividend of 6d. per share has been paid in respect of 1950. The most recent accounts, those for the calendar year 1949, show a profit before providing for taxation of £693,014. Of this, £309,000 was set aside for taxation, £200,000 was placed to general reserve—which now amounts to £400,000—leaving available £184,014, plus £76,433 brought forward from the previous year, a total of £260,447. The dividends totalling 1s. 6d. per share absorbed £184,898, leaving £75,549 to be carried forward.

This company's record shows steady successful progress. The property has responded excellently to the foresight which characterized its initial planning, and each year brings increasing evidence that the confidence which has been shown in the mine and its prospects has been well placed.

# Anglo-French Exploration Co. Ltd.

WITH the submission to members of the report and accounts covering the calendar year, 1950, Anglo-French Exploration can look back over 62 years in which it has successfully conducted business as a mining and financial investment company. Although the company's interests are widely spread over gold mines, tin producers, copper mines and oilfields, the great weight of its holdings is in the mines along the West Wits line.

Of the five mines in this area, Blyvooruitzicht, West Driefontein, Doornfontein, Libanon and Venterspost, only Blyvooruitzicht is missing from the company's portfolio. Venterspost has reached the dividend stage, Libanon should be paying by 1952 at the latest, Doornfontein should show satisfactory results in due course, and although it is unlikely that West "Dries" will reach the dividend stage before 1953-54, preliminary results give every indication that once crushing begins the results will be spectacular.

Another sign that the company has not allowed its financial vigour to be blunted with the passage of years has been the strengthening of its Orange Free State portfolio beyond its earlier holdings which were in New Consolidated, Free State Exploration Co. and Western Holdings. In 1949 it acquired an interest in Free State Geduld and Orange Free State Investment Trust which was followed by the addition of Welkom Gold Mining and Wit Extensions during 1950. Other holdings in gold mining companies as at December 31, 1950, were Consolidated Goldfields of South Africa, Durban Roodepoort Deep, Luipaards Vlei Estates and Gold Mining, Vlakfontein Gold Mining, West Witwatersrand Areas, and Harrietville (Tronoh) which is an Australian gold dredging company.

A substantial portion of the company's dividend revenue also comes from its carefully selected shareholdings in the Northern Rhodesian copper companies which comprise Nchanga Consolidated Copper Mines, Rhodesian Selection Trust and Rhodesian Anglo American, and from its interests in Malayan tin mining companies—Ayer Hitam Tin Dredging, Pengkalen Ltd., Petaling Tin, Sungei Besi Mines and Sungei Way Dredging. Tin and copper companies have been on a rising curve of prosperity for almost a year now.

To the impressive list of interests mentioned above must be added holdings in two more tin concerns, Anglo-Burma Tin, which unfortunately is at present inactive owing to insurgent activity, and Rooiberg Minerals; a stake in the oil industry through its investments in Apex (Trinidad) Oilfields and Ultramar, both of which are forging ahead, a participation in the South African coal industry through its holding in the Transvaal producer, Apex Mines; and lastly, an interest (secured during the year) in Mount Isa Mines, the important Australian copper-lead-zinc producer.

At December 31, 1950 the book cost of the company's investments stood in the balance sheet at £929,853. Of this amount £883,047 represented quoted securities at or under cost having a market valuation of £1,038,998 and the remainder, £48,806, represented the book cost of its unquoted investments having a directors' valuation of £46,784.

During the calendar year, 1950, income from dividends and interest declined to £50,912 compared with £62,715 (exceptional non-recurring dividends were received in 1949), as also did profit from the sale of farms and land in Southern Rhodesia which was £1,528 lower at £5,571. Profit from the sale of shares and sundry credits remained virtually unchanged at £37,036 (£37,469), giving a total revenue for the year of £93,519 compared with £107,283 previously. After charging all administrative expenses net profit before taxation worked out at £78,784 to which was added £28,687 brought in, making £107,471 available compared with £120,170 in 1949. Taxation called for £38,328 (£30,857), an amount of £9,250 against £29,026 was written off investments, and the dividend on the £750,000 issued capital was maintained at 7½ per cent for the sixth year in succession, absorbing a net amount of £30,938.

In his annual statement to shareholders last March, the chairman, Mr. F. R. Cottell, said that it was time that the price of gold, like other commodities, should be allowed to reflect something nearer its real value and that so long as it was kept at an artificially low price it could not fulfil its true functions. Commenting on the policy of the International Monetary Fund he declared that there was increasing evidence that it was out of line with present day requirements but that in time the I.M.F. would he believed, be forced to face the realities of the situation. Finally, he told shareholders that the position of their company was a strong one and that "there is no reason to expect that the revenue for the current year will not be at least maintained."

# Tronoh-Malayan Tin Group

THIS group of companies continues to make a major contribution to the Malayan tin output, to the dollar pool, and to the British Exchequer. Taking the last published accounts for each of the companies in the group covering various twelve-monthly periods between the beginning of 1949 and the middle of 1950, the tin ore recovery of the group amounted to over 10 per cent of the total production of the Federation, between July, 1949 and June, 1950.

The important contribution which this group is making should not, however, be allowed to obscure the underlying difficulties of the situation confronting them, in common with other Malayan producers. Banditry remains a threat to production and largely prohibits prospecting, while latterly the spectre of inflation has been threatening to challenge even the bandit, as the tin miners' principal worry. These, and some of the other difficulties which are besetting the Malayan producer, are discussed at greater length on another page by our Malayan correspondent, but lest the very encouraging increase in output which is being recorded by this group should lull any British reader into complacency, one aspect of the situation in particular calls for re-emphasis here.

The suspension of activities during the war, followed by the failure of the authorities to suppress the activities of the Malayan bandits has meant that since about 1942 prospecting for new ore reserves has been virtually at a standstill, while output for the past couple of years has now been up to pre-war levels. Known reserves are thus rapidly dwindling, and as matters stand, it can only be a question of a very few years before this position will be directly reflected in a diminishing Malayan tin production.

This state of affairs has at last received official recognition from the Malayan Government who, following a debate on the Federation's Six-year Draft Development Plan, agreed to sponsor a survey of the country's tin-ore deposits. While any official assistance in this direction cannot but be welcomed, the fact remains that the two most urgent steps to be taken to safeguard future Malayan tin production are first of all to bring peace to the country, and secondly, to facilitate prospecting and re-equipment by the mines through adequate financial reliefs.

## MALAYAN TIN DREDGING LTD.

The property of Malayan Tin Dredging consists of 4,669 acres of tin bearing land on lease in Malaya, divided into two sections—the old Batu Gajah area (now almost completely worked out) and the new area of approximately 2,505 acres at Kampong Gajah.

The plant installed on the property comprises several dredges, only one of which was in operation at the end of the year to June 30, 1950. Of the other four, the *No.* 1 *dredge* operated at the Batu Gajah section until December 1, when it was sold to Sungei Way Dredging. The *No.* 6 *dredge* (Batu Gajah) worked in a sub lease area until June 15, and was then dry docked for essential pontoon repairs to be carried out.

The reconstruction of the *No.* 2 *dredge* has been completed and trials started in December, 1950. Erection of the *No.* 3 *dredge* commenced and at the end of the year was near completion. It is hoped that dredging will begin in June, 1951.

The operation of the *No.* 5 *dredge*, which worked at the Batu Gajah section throughout the year, was satisfactory, but it was impossible to stick to the planned dredging course owing to the increasing number of limestone pinnacles at less than floating depth. As was to be expected from the foregoing, operating results as a whole showed a considerable reduction on those of the previous year. The volume of ground treated fell by 1,626,000 cu. yd. to 4,823,000 cu. yd., and the tin ore yield by 535 tons to 566 tons.

The financial results for the year ended June 30, 1950, showed a working profit of £114,764 compared with £208,570 in the previous year (see table on next page). The 25 per cent distribution to shareholders absorbed £27,500, compared with 50 per cent in the previous year.

As anticipated, output during the current year is on a reduced scale, with returns for the first nine months showing a tin ore recovery of 214 tons against 489 tons for the same period of the previous year. Conditions are expected to improve now that the No. 6 dredge, which resumed work on November 13, is fully operational. Moreover the Kampong Gajah section where the Nos. 2 and 3 dredges are erected, will in due course be making its contribution to tin ore recovery, and in this connection, the chairman, Mr. H. Ashworth Hope, estimates provided nothing serious interferes with normal working at the mine, the No. 2 dredge, after opening out, should produce, in its first 12 months, just over 600 tons of tin ore. Two interim dividends totalling 10 per cent have been declared for the year to June 30, 1951.

## SOUTHERN MALAYAN TIN DREDGING LTD.

The company controls some 5,170 acres of tin bearing land in Malaya.

The equipment of the company comprises seven dredges. Of the four dredges operating in the *Tanjong Tualang Section*, rehabilitation of the *No.* 1 *dredge* was completed during the year to June, 1950. A trial run began on May 1, and the subsequent performance was satisfactory. The *Nos.* 2, 3 *and* 4 *dredges* worked satisfactorily throughout the year.

The *No.* 5 *dredge* in operation at the *Teja Section*, worked a complete year, but a further shallowing of the ground, and the exceptional amount of buried timber, resulted in a falling off in the yardage treated.

Of the two dredges at the *Temoh Section*, the *No.* 1 *dredge* operated throughout the year. With regard to the *No.* 2 *dredge*, consideration is now being given to its rehabilitation. This change of mind arises from the results obtained by an experimental grab dredging plant.

The General Manager reports that with the exception of the No. 2 dredge at the Temoh Section, rehabilitation of the property and equipment is virtually complete. Satisfactory results were obtained from operations in the year to June 30, 1950. The volume of ground treated rose by nearly 3,000,000 cu. yd. to 13,095,000 cu. yd., which yielded 2,329 tons of tin ore, an increase of 753 tons over the previous year.

Working profit for the year on this higher output rose by nearly £250,000 to £574,049 (see table on next page). The dividend distribution to shareholders totalled 80 per cent, and required £190,300, compared with the previous year when shareholders received 60 per cent.

Operations in the current year to June, 1951, are continuing on much the same scale, and tin ore recovery in the first nine months at 1,737 tons compared with 1,766 tons in the same period of the year to June, 1950. The directors have announced two interim dividends totalling 40 per cent for 1951.

## TRONOH MINES LTD.

This company owns alluvial tin-mining properties at Tronoh and Kampar, Perak, Malaya, covering an area of more than 5,500 acres, on which four dredges are in operation. The company has a wholly-owned subsidiary in Tin Lay Ltd., with tin bearing properties in Siam, on whith one dredge operates and which in 1949 showed a profit of £11,049. Additionally Tronoh has large interests in the tin producers Sungei Way Dredging, Sungei Besi Mines, Pengkalen, Malayan Tin Dredging, Gopeng Consolidated and Tekka-Taiping.

Despite an increase of 665,000 cu. yd. to 4,467,500 cu. yd. in the volume of ground treated, the tin ore yield in the year to December 31, 1949, fell by 71 tons to 1,245 tons.

Normal operations by the *No.* 1 *dredge* (the largest of the four) at the *Tronoh Section* commenced on August 7, and until December 28, worked through tailings towards virgin ground. Tin ore recovery was only 45 tons.

At the *Kampar Section*, the *No.* 4 *dredge* worked to an average depth of 61 ft., treating 1,326,600 cu. yd. for a recovery of 529.10 tons. During the latter part of the year a new bucket band was fitted to the dredge. The *No.* 5 *dredge*, also at Kampar, worked to a similar depth, treating 1,540,500 cu. yd. to recover 332 tons of tin ore. The dredge worked out irregular areas in the old tailings of Nos. 4 and 8 dredges. At June, 1950, it was working ground between the Nos. 4 and 8 dredge courses. Operations of the *No.* 8 *dredge* (Kampar) were also at a depth of 61 ft., the treatment of 1,600,400 cu. yd. resulting in a yeild of 339 tons.

The adverse effects of the lower tin ore recovery during 1949 were almost nullified by the higher price received per ton, and working profit increased on the year by £22,598 at £367,847 (see table). Holders of the company's 5s. shares received £132,000 by way of dividends, equal to 80 per cent compared with 65 per cent in 1948.

With the No. 1 dredge working virgin ground during 1950, substantial improvement was shown in the tin ore yield, which rose by no less than 870 tons to the very high total of 2,114 tons. In addition the metal price has been considerably higher. Shareholders will no doubt be awaiting publication of the 1950 accounts with some eagerness, despite the fact that the last dividend has already been declared, making a total of 100 per cent for the year against 80 per cent. Meanwhile, a first interim of 20 per cent has been declared in respect of 1951.

## SOUTHERN TRONOH TIN DREDGING LTD.

This company owns mining leases over approximately 600 acres of tin-bearing land situated in Tanjong Tualang, Perak, Malaya. The company has two dredges in operation. Southern Tronoh holds substantial interests in other tin producers and an investment in Harrietville (Tronoh) Ltd. The No. 1 dredge re-started operations in October, 1946, and the No. 2 dredge in June, 1947. All-round improvement was revealed by the latest available accounts, for the year to December 31, 1949.

Operations by the *No.* 1 *dredge* covered 16.94 acres, to an average depth of 70 ft. The volume of ground treated was 1,736,500 cu. yd., which yielded 632 tons of tin ore. In the previous year a yardage of 1,081,100 was treated and 300 tons of tin ore recovered. The *No.* 2 *dredge* covered 14.96 acres, and the ground treated totalled 1,526,900 cu. yd. (compared with

1,502,500 cu. yd.). This treatment yielded 428 tons of tin ore (491 tons). This dredge was shut down for seven weeks for a major repair to the bucket ladder, and for general overhaul. The bucket band was also renewed.

The results of these operations are shown in the table and resulted in a working profit of £262,461 (£161,501). Payment of the declared 80 per cent dividend for the year on the 5s. shares absorbed £88,000.

Expectations that during 1950 one dredge at least would be converted from steam to electric power, were not realized, owing to the delay in delivery of necessary materials. It is anticipated that the change-over will take place this year.

The high rate of tin ore output in 1949 was not maintained in the year to December 31, 1950, when operations yielded 847 tons, a reduction of 210 tons. This, however, will be well cushioned by the substantially higher price of tin. Dividend declarations for the year to 1950 number five and total 90 per cent against 80 per cent in the previous year. The directors have announced a first interim of 20 per cent for 1951.

## AYER HITAM TIN DREDGING LTD.

This company owns mining leases covering 1,930 acres of tin land situated in the Ulu Langat District of Selangor, Malaya, of which some 150 acres have been dredged. One dredge operates on the property having a designed working capacity of 230,000 cu. yd. per month down to a depth of 120 ft.

The manager's report showed that during the twelve months to June 30, 1950, the dredge continued working in a southerly direction in deep ground, until May 30, when it was turned westwards. The new working face has been opened up to approximately 13 chains, and the dredge will soon be operating in ground where the depth will be within its capacity. Satisfactory working during the year resulted in an increase of 376,805 cu. yd. in the volume of ground treated at 2,224,690 cu. yd., which yielded 727 tons of tin ore, a rise of 75 tons.

Despite this output advance, the accounts showed that revenue from sales of tin ore fell by some £8,000 to £265,981. This was due to the inclusion of £51,000 in the 1949 accounts, being profits from production in the previous year. As a result working profit was about the same as the previous year at £169,615 (see table). £59,400 was required to meet the 60 per cent dividend payment on the 5s. shares, which compared with 65 per cent in the previous year.

Boring operations were restricted to land within sight of the dredge. The results obtained were satisfactory, but due to security conditions, no attempt was made to prove the area. "This work," said the chairman, Mr. G. W. Simms, "will be put in hand when security conditions are such that it can be undertaken safely."

Operations in the current year to June 30, 1951, got off to a reasonably good start with a first quarter's output of 178 tons. But in the second quarter to December, the ground worked contained hardly any tin down to dredging depth and output only amounted to 30 tons. In November it was decided to move forward towards richer ground further ahead. The third quarter's return reflected the result of working in higher-grade ground, output being 243 tons. Interim dividends totalling 60 per cent have been declared in respect of the current year.

## SUNGEI BESI

The properties for which this company holds mining leases comprise approximately 400 acres near Sungei Besi, Malaya, and 1,084 acres at Kota Tinggi, Johore. One dredge is in operation at the Kota Tinggi area, whilst the Sungei Besi area is worked as an opencast mine.

During the year to March 31, 1950, good progress was made at the *Sungei Besi Section* towards clearing the low-grade ground around excavations made by the Japanese during their occupation of the property. The richer ground below is being uncovered as the work proceeds. The total yardage of mined and dumped ground in both the north and south opencast mines was almost double that of the previous year. With five mechanical excavators at work and the rehabilitation of the mechanized equipment almost completed, this work is progressing more speedily. To facilitate further the transportation and dumping of unpayable ground, a belt conveyor system has been installed to handle overburden. The increased tempo of work on the removal of unpayable ground resulted in a reduced yardage mined for treatment at 289,385 cu. yd. This treatment yielded 344 tons of tin oxide compared with 402 tons. The dredge working at the *Pelepah Section* (*Kota Tinggi*) produced good results, treating an increased yardage of 2,497,126 cu. yd. to recover 738 tons of tin ore. These figures compare with 1,730,629 cu. yd. and 522 tons respectively.

Thus there was a total tin ore recovery of 1,082 tons compared with 924 tons in the previous twelve months. Working profits, as shown in the table on this page amounted to £195,951 compared with £175,683 in the previous year. The total dividend distributions to shareholders amounted to 2s. 7.2d. per 4s. share (equal to 65 per cent), and called for £58,462. In the previous year a dividend of 60 per cent was declared. Dredging during the early part of the current year to March, 1951, was adversely affected by the presence of granite boulders. Subsequently conditions improved and there was a small decline in the year's output at 1,036 tons. To date the directors have declared three interims totalling 45 per cent in respect of the current year.

## SUNGEI WAY DREDGING LTD.

Sungei Way, which is incorporated in the Federation of Malaya, owns 1,229 acres of tin-bearing land situated at Sungei Way, Selangor, Malaya. The property is divided as to 784 acres sub-leased to Sungei Way, whilst the balance of 445 acres is held free from tribute. One dredge is at present in operation but two further dredges are in the course of erection. During the year to June 30, 1950, the issued capital was increased to $1,715,714 (Malayan) by the issue of 285,714 $1 shares in part payment of the new dredge, under erection.

The operating dredge, the *No.* 2 *dredge*, worked satisfactorily throughout the year with a break of only 14 days for routine maintenance. Dredging covered 13.35 acres at an average depth of 61 ft., representing a yardage for the year of 1,226,791 cu. yd. which yielded 323.14 tons of tin ore. In the previous twelve months 1,055,076 cu. yd. were treated for a tin ore recovery of 258 tons. Erection work on the *Nos.* 1*A* and 3 *dredges* is going well and it is anticipated that the former (purchased from Malayan Tin Dredging Ltd.) will be in operation by about the middle of 1951. The *No.* 3 *dredge*, it is hoped, will commence digging operations before the end of 1951.

Working profit for the year (see table) amounted to $400,871 (£46,768) compared with $225,976 (£26,364). The directors considered that in view of the very heavy capital commitments for the replacement dredge and the rehabilitation of the No. 3 dredge, no dividend should be recommended.

Recovery of tin ore during the current year to June, 1951, again shows improvement. For the nine months to March, production at 291 tons exceeded the output for the same period of the previous twelve months by some 70 tons. This increase, together with the higher price of tin, was sufficient for the directors to declare an interim dividend of 5 per cent on account of the current year.

### SUMMARY OF OUTPUT, PROFIT AND TAXATION

| Name of Company | Period Ending | Ground Dredged (000 cu.yd.) | Tin Ore Recovery (tons) | INCOME: Ore Sales and Stock (*less Govt. Tin Royalty*) £ | INCOME: Tribute and Sundry Mine Revenue £ | INCOME: Interest, Dividends, etc. £ | EXPENDITURE: Mining Costs £ | EXPENDITURE: Head Office and Other Expenses £ | Profit Before Tax £ | Govt. Tin Royalty (*see Ore Sales*) £ | Taxation £ | Dividend £ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Malayan Tin Dredging | 30/6/49<br>30/6/50 | 6,449<br>4,823 | 1,101<br>566 | 350,805<br>193,703 | 11,318<br>5,479 | 51,460<br>62,774 | 181,869<br>126,567 | 23,144<br>20,625 | 208,570<br>114,764 | 69,964<br>35,811 | 81,141<br>42,536 | 55,000<br>27,500 |
| S. Malayan Tin Dredging | 30/6/49<br>30/6/50 | 10,202<br>13,095 | 1,758§<br>2,546§ | 557,962<br>843,992 | 10,457<br>11,548 | 20,192<br>23,496 | 235,234<br>275,311 | 24,944<br>29,676 | 328,433<br>574,049 | 98,518<br>148,484 | 171,608<br>316,594 | —<br>190,300 |
| Tronoh Mines | 31/12/48<br>31/12/49 | 3,802<br>4,467 | 1,316<br>1,245 | 445,045<br>432,341 | 58,673<br>78,010 | 39,962<br>108,922 | 182,032<br>229,219 | 16,399<br>22,207 | 345,249<br>367,847 | 79,400<br>74,234 | 195,193<br>182,638 | 107,250<br>132,000 |
| Southern Tronoh Mines | 31/12/48<br>31/12/49 | 2,584<br>3,263 | 791<br>1,060 | 272,262<br>369,316 | 5,176<br>19,239 | 8,421<br>14,323 | 114,041<br>123,352 | 10,317<br>17,065 | 161,501<br>262,461 | 44,766<br>64,548 | 83,637<br>142,907 | 55,000<br>88,000 |
| Ayer Hitam Tin Dredging | 30/6/49<br>30/6/50 | 1,848<br>2,225 | 652<br>727 | 273,882<br>265,981 | 521<br>11 | 9,181<br>12,716 | 99,333<br>95,610 | 12,472<br>13,483 | 171,779<br>169,615 | †<br>46,175 | 90,621<br>98,689 | 64,350<br>59,400 |
| Sungei Besi Mines | 31/3/49<br>31/3/50 | 2,069<br>2,787 | 926<br>1,082 | 320,299<br>382,192 | 6,032<br>2,892 | 3,530<br>6,527 | 141,210<br>179,289 | 12,968<br>16,371 | 175,683<br>195,951 | †<br>69,527 | 93,292<br>105,897 | 53,985<br>58,462 |
| Sungei Way Dredging | 30/6/49<br>30/6/50 | 1,055<br>1,227 | 258<br>323 | 90,006<br>118,263 | 2,212<br>1,512 | 5,006<br>4,900 | 67,522*<br>73,279* | 3,338<br>4,628 | 26,364<br>46,768 | †<br>† | —<br>— | —<br>— |
| Total | Previous a/c<br>Last a/c | 28,009<br>31,887 | 6,802<br>7,549 | 2,310,261<br>2,605,788 | 94,389<br>118,691 | 137,752<br>233,658 | 1,021,241<br>1,102,627 | 103,582<br>124,055 | 1,417,579<br>1,731,455 | †<br>† | 725,492<br>889,261 | 335,585<br>555,662 |

*Includes tribute payment of £4,068 in year to 30/6/49 and £5,355 in year to 30/6/50. §Includes recovery from amang dumps and tribute workings. †Not available.

# Redruth-Malayan Tin Group

COLLECTIVELY the activities of this group of tin companies as revealed in their most recently published reports (covering 1949 and the early part of 1950) differed little from those of the preceding year. There have been slight changes in individual outputs, but production of the group as a whole was almost the same at well over the 2,000 tons mark.

The latest available accounts of the companies showed that, in the aggregate, royalties of £133,000 to the Malayan Government reduced the mining profit to £431,000, from which a further £235,000 was required to meet United Kingdom taxation assessments. Against this, dividend payments have only amounted to £137,000 on a combined capital of £1,800,000. The group as a whole has so far spent about £342,000 on rehabilitation, against which some £260,000 has been received from the Malayan Government as an advance on whatever compensation for war damage is finally assessed. Since the period covered by these accounts good progress has been made in the final assessment of compensation, which, however, owing to limitation of funds seems likely to be considerably scaled down from the amount originally claimed.

It will be seen from the dates of the separate accounts that in the period covered the group benefited hardly at all from the much higher price obtaining for tin in the past year. Certain it is that when the accounts are available for the period in which these higher prices prevailed, profits will be found to have increased, even though royalties to the Malayan Government and United Kingdom taxation will both require considerably larger sums and costs will by then have increased still further.

Malayan producers can probably maintain their present rate of output for a time, but with the growing demands of industrial production—both civilian and military—likely to continue for some years (notwithstanding high prices and suspension of stockpiling), it becomes of paramount importance to provide for the future tin supply. An essential to this end is additional equipment; but with taxation at its present level, the amount that Malayan tin producers operating have been able to put aside for this purpose is not nearly sufficient, considering that the cost of a new dredge is in excess of £250,000.

Prospecting in the past two years has been almost impossible and directors will naturally consider this their first task when once Malayan terrorists and bandit activities have been suppressed. Here again capital will be required.

It should also be remembered that the dollar earning capacity of the Malayan tin industry in 1950 amounted to more than $100,000,000, and the industry will clearly be expected to continue its high contributions to the dollar pool, a contribution which is dependent on the level of production being maintained.

## GOPENG CONSOLIDATED LTD.

Gopeng Consolidated Ltd., registered in 1912, stems from an amalgamation of the Gopeng Tin Mine Ltd. and New Gopeng Ltd The company owns property comprising 1,860 acres of tin bearing land at Gopeng, Kinta, in Malaya, from which tin is won with hydraulic equipment. Other interests include a joint interest with Kinta Tin Mines Ltd. in a further 2,200 acres. The company also owns the Moynalpy Rubber Estate with 563 acres planted, and a half interest in the Sanglop Rubber Estate which has almost 825 acres under cultivation.

Operations during the year to September 30, 1949, were on a slightly lower scale than for the previous year. An acute water shortage and hard ground resulted in a fall of 422,100 cu. yd. in the volume of ground treated to 1,714,200 cu. yd., and there was a consequent fall of 76 tons in the tin ore yield, which amounted to 721 tons. Production cost per ton rose £10 to £103 and cost per cu. yd. rose by 2.1s. to 10.4s. At the same time the price received per ton increased by £23 to £340.

Despite the fall in production, mining profit was only fractionally down at £180,585 (see table on next page). Dividend payments totalled 30 per cent (6s. for each £1 stock unit) and required £65,301. In the previous year the dividend had been 25 per cent.

Operations at the *No.* 1 *paddock* were restricted for a period of four months owing to a shortage of water and there was a reduction of some 237,000 yd. in the volume of ground treated at 623,400 cu. yd. The value of the ground, however, rose by 0.16 lb. to 0.79 lb. of tin ore per cu. yd., with the result that the total tin ore recovery fell by only 24 tons to 210 tons. Cutting continued throughout the year to the east in comparatively low grade ground, and westwards until January (1949) when heavy limestone was struck. The west development was then transferred to an area near the pump site where higher values were obtained.

Work at the *No.* 2 *paddock* produced tin ore totalling 256 tons from a treatment of 775,800 cu. yd. These figures compare with 325 tons from 944,600 cu. yd. in the preceding year. The Geruntong Water Supply was employed in cutting to the north-east of the paddock until May, 1949, when part was transferred to work at the new No. 3 paddock. The remainder was moved to No. 3 at the end of the year. Work in the west was carried on at the 50 ft. level until January, 1949, and sinking operations moved on to the 80 ft. level. Here hard ground was discovered and the yardage treated was adversely affected.

Progress in the new *No.* 3 *paddock* has been satisfactory and development reached the 40 ft. level. The sluices dealt with 196,100 cu. yd. and recovered 224 tons of tin ore.

During the year orders were placed for pipes required for the first stage of the Kampar water supply pipeline deviation, which when completed will make a considerable further area available for working.

Operations during the year to September, 1950, have been carried on in ground of better values and the output at 829 tons of tin ore has more than offset the 58 tons reduction sustained in 1949. Production for the six months to March, 1951, totalled 381½ tons. With regard to the financial results to October, 1950, the higher output will be supplemented by the much higher price for tin, from which previous accounts have received no benefit, and there can be little doubt that, despite the chairman's warning of increased costs, profits will show a substantial improvement. Interim dividends for the year to September, 1950, have been declared totalling 42½ per cent. A first interim of 15 per cent for the current year has also been announced.

## RAMBUTAN LTD.

Rambutan Ltd., the oldest member of the group, was registered in May, 1905. This company owns 1,146 acres of alluvial tin bearing ground situated in the Perak district of Malaya, from which tin is won by hydraulic installations. Rambutan has an interest in an additional 91 acres of an adjoining property. Following the end of the war, the company resumed control of the property and recommenced production in the latter part of 1946.

In the year to June, 1948, its first full year of working since the war, Rambutan produced 64 tons of tin ore, enabling the payment of a 3¾ per cent dividend on the £100,000 (£1 shares) of capital. Output in the following year improved to 100 tons, and from a net profit of £23,600 shareholders received 11¼ per cent.

Operations in the year ended June 30, 1950, have been on a similar scale, the volume of ground treated at 384,300 cu. yd. rising by only 18,800 yd., while the tin ore production totalled 101 tons. The average price received rose by £13 to £356 per ton, but this was more than offset by the sharp rise in production costs, which amounted to £179 per ton compared with £147 in the previous year. Mining profit for the year was practically unchanged (see table). Dividend distributions to shareholders totalled 12½ per cent against 11¼ per cent in the previous year, and required £6,875.

Operations during the year in the "Y" paddock, which produced the bulk of the company's tin ore output (86 tons), continued in the lower lift to the east and south. Much stone and boulder again prevailed and had to be removed. Work in the "P.2" paddock was halted in Janurary, 1950, all payable ground having been exhausted. Output here was only 10 tons. A new area, Paddock "Z," was started in January, 1950, to the south of "P.2." The ground treated was mainly tailings, which overlay values in depth, and although more than 100,000 cu. yd. were treated, the tin ore recovery only amounted to 5.18 tons.

Production for the nine months from June, 1950, to March, 1951, of tin ore amounted to 66¼ tons compared with 75 tons in the corresponding period a year ago. The two interim dividends of 5 per cent which have already been declared for this period are indicative of the increased earnings which all the groups' companies should enjoy in the financial period covering the post-Korean tin price inflation.

## TEKKA LTD.

Tekka Ltd. is one of the younger members of the group, having been registered in 1920. The property, consisting of 963 acres of alluvial tin lands, is situated in the Kinta district of Perak, Malaya. The original equipment consisted of monitors, gravel pumps, elevators and hydro-electric plant, but during the Japanese occupation of the property, the hydro-electric and Diesel plant was destroyed. The company does not intend to replace this plant, and tin is at present being won with hydraulic equipment.

Although dredging operations during the 12 months to March 31, 1950, covered a yardage of 518,900 against 350,000 in the previous year, the value of the ground treated was greatly reduced at 0.51 lb. per cu. yd. compared with 0.89 lb. Production of tin ore consequently fell by 24 tons to 116 tons, the price received being practically unchanged at £297 per ton. While costs per ton rose sharply to £201, an increase of £59, owing to the lower value of the ground treated, it is notable that operating costs per cu. yd. were nearly 20 per cent lower at 10.81d.

As will be seen from the table on the next page, the mining profit on this reduced output was about £10,000 down at £14,914. The dividend distribution for the year of 3¾ per cent amounted to £7,396. In the previous year a dividend of 5 per cent was declared.

Until the end of July, 1949, operations continued in a southerly

direction. Then plant and water were transferred to the new paddock under development to the west. Opening up towards higher grade ground to the west much limestone was encountered and heavy blasting was necessary to maintain levels. In March, 1951, the plant in use consisted of three 2¾ in. elevators and three 2 in. monitors.

Providing penetration of the limestone barrier to the west was not unduly delayed, output for the year to March, 1951, was expected to show some improvement. In the event, however, production was slightly lower at 110 tons of tin ore and workings are now reported to be entering lower grade ground. The financial results for this period should, however, reflect the considerably higher price obtaining for tin, as is borne out by the fact that interim dividends totalling 3¾ per cent have already been paid. In September of last year the directors declared an interim dividend of 1¼ per cent, and a further interim of 2½ per cent in February this year was announced, both in respect of the 12 months to March, 1951.

## TEKKA-TAIPING LTD.

Registered in 1919 Tekka-Taiping Ltd. owns alluvial tin mining land situated in Taiping, Malaya, covering an area of some 2,052 acres. Originally three bucket dredges were operating on the property, but after the Japanese occupation much rehabilitation was necessary. Operations were resumed in September, 1947, with one dredge which, for the 12 months to October, 1948, treated 1,762,300 cu. yd. of ground for a tin ore yield of 390 tons. In the following year both these figures were improved upon, the volume of ground treated rising to 2,117,700 yd., more than half of which was tailings, and tin ore output to 430 tons. The price received per ton of tin ore was only £11 higher at £343, whereas costs per ton rose by £28 to £162 (costs per cu. yd. being fractionally less at 7.9s.).

The table on this page shows that mining profit on the increased output was practically unchanged at £79,099. Shareholders received a dividend for the year of 10 per cent (compared with 12½ per cent) which required £21,999. New oil firing equipment has been delivered, but not yet installed, owing to the continued competitive price at which wood fuel is obtainable.

During the year to October, 1950, the dredge had to work through shallow ground of low grade and, at 195 tons, output was down to half that in the year to October, 1949, while output for the following five months to March 31, 1951, amounted to 95 tons of tin ore.

The results so far obtained from the shallow ground area have, however, not even been up to the bore indications, but there are reasonable hopes of an improvement.

The accounts to October 31, 1950, will reflect only to a small extent the recent rise in the tin price and it is therefore understandable that no interim dividend has been declared for this period. An interim of 2½ per cent has, however, already been declared in respect of the current year which will, of course, receive the full benefit of the higher price.

## PENGKALEN LTD.

Pengkalen Ltd. was registered in 1907, and owns 796 acres of tin bearing land at Pengkalen, Lahat, Malaya. The company also owns mining leases covering an additional area of 226 acres. The property is equipped with two bucket dredges, but the No. 1 dredge, after an examination of the treatment it received whilst in enemy hands, was found to have only scrap value. The No. 2 dredge, the larger of the two, resumed dredging in March, 1947. At September 30, 1949, there remained approximately 445 acres of dredgeable ground. A further 81 acres will be freed for the dredge when the deviation of the Kinta River is completed.

Satisfactory results were obtained from operations during the year to September 30, 1949, when a slightly higher volume of ground was treated. From the 1,993,500 cu. yd. dealt with, the tin ore recovery totalled 408 tons compared with 396 tons from 1,777,000 cu. yd. in the previous year. Costs per cu. yd. were unchanged at 8.1s., although costs per ton were £13 up at £164. There was an increase of £36 in the average price received at £349 per ton.

Mining profit was up by about £9,000 at £77,735 (see table on this page). Dividend distributions for the year on the 5s. Ordinary shares amounted to 22½ per cent, and on the 5s. Preferred Ordinary shares the total was 32½ per cent. Payments in the previous year were 20 per cent and 30 per cent respectively.

After crossing the Kinta River the dredge proceeded northwards until reaching the company's boundary, when it turned in a south-westerly direction. Conditions for dredging were fair but occasional timber and clay hampered operations. The northern section of the Kinta River new channel, 41 chains in length, was completed.

Excellent output results have been achieved in the year to September, 1950. Tin ore recovery at 561 tons was better than anticipated, exceptionally rich patches having been worked. With this increase of 153 tons over the previous year and the higher price the company must have received for its output, the financial results for the year should show a substantial profit improvement. Interim dividends so far declared number four and total 35 per cent on the Ordinary and 45 per cent on the Preferred Ordinary shares.

Tin ore output in the first six months of this year was 267¾ tons. One interim dividend of 10 per cent (20 per cent on the Preferred) on account of the current year to September, 1951, has been announced.

## KENT (F.M.S.) TIN DREDGING LTD.

Registered in 1926, Kent (F.M.S.) Tin Dredging Ltd. is the youngest member of the group. The company owns a sub-mining lease over approximately 610 acres of the Kent Estate, Kuala Lumpur, the tribute payable being on a sliding scale, from 6 per cent to 10 per cent, based on the price of tin. Mining leases are held covering an area of about 45 additional acres. The property is equipped with one dredge. After the Japanese occupation, operations were resumed in September, 1946.

Working results in 1949 were satisfactory, the treatment of 1,603,600 cu. yd. producing 381 tons of tin ore, compared with the previous year when the dredge treated 1,581,150 cu. yd. for a recovery of 368 tons. The company received £330 per ton, an increase of £15 over 1948, and reduced costs by £5 to £187 per ton, costs per cu. yd. being also fractionally lower at 10.7d.

As the table below shows, mining profit improved to £54,793. Holders of the £105,000 capital, divided into shares of 2s. each, received a total dividend of 20% the same as for 1948.

During the year dredging continued northwards until reaching the boundary. The course then turned west where the ground treated was of higher value. Stiff clay was encountered in the early part of operations, but conditions became easier during later working.

Very satisfactory results have been achieved in the year to December 31, 1950, with tin ore output at the excellent level of 514 tons. Moreover, in its accounts to December, 1949, this company had only a very small share of the increase in the price of tin—some six weeks at the end of its previous accounting period. Production has been evenly divided over the year and in the latter half, when the price of tin soared following the start of the Korean war, 255.75 tons of tin ore were recovered. There must consequently have been a considerable improvement in profits during last year, some evidence of which is to be seen in the declaration to date of three interim dividends totalling 45 per cent compared with the 20 per cent which shareholders received in 1948 and 1949. Interim dividend of 25 per cent has also be declared in respect of 1951.

**SUMMARY OF OUTPUT, MINING PROFIT AND TAXATION**

| Name of Company | Period | Area Dredged (000 cu. yd.) | Tin Recovery (tons) | Ore Sales £ | LESS Govt. Royalty £ | LESS Smelters Charges £ | LESS Tribute on Ore sold £ | LESS Mining Expenditure £ | PLUS Sundry Revenue from Tribute etc. £ | Mining Profit £ | PLUS Sundry Revenue £ | LESS Head Office and Other Expenses £ | Net Profit £ | Tax £ | Dividend £ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gopeng Consol. | 30/9/48 | 2,136.3 | 797 | 299,502 | 44,782 | 1,321 | — | 73,102 | 7,575 | 187,872 | 14,558 | 6,031 | 196,399 | 108,357 | 54,417 |
| | 30/9/49 | 1,714.2 | 721 | 291,522 | 44,294 | 1,669 | — | 74,233 | 9,?.59 | 180,585 | 9,391 | 11,461 | 178,515 | 98,380 | 65,301 |
| Rambutan ... | 30/6/49 | 365.5 | 100 | 40,771 | 6,131 | 201 | 58 | 14,712 | 5,282 | 24,951 | 2,189 | 3,540 | 23,600 | 12,453 | 6,186 |
| | 30/6/50 | 384.3 | 101 | 42,778 | 6,473 | 225 | 30 | 18,133 | 5,771 | 23,688 | 2,705 | 2,841 | 23,552 | 13,139 | 6,875 |
| Tekka ... ... | 31/3/49 | 350.0 | 140 | 54,173 | 8,475 | 292 | 3,611 | 19,887 | 2,371 | 24,279 | 7,760 | 2,308 | 29,731 | 16,051 | 9,861 |
| | 31/3/50 | 518.9 | 116 | 45,835 | 7,241 | 294 | 3,729 | 23,378 | 3,721 | 14,914 | 8,408 | 2,434 | 20,888 | 6,728 | 7,396 |
| Tekka-Taiping | 31/10/48 | 1,762.3* | 390 | 152,609 | 22,865 | 54 | — | 52,554 | 958 | 78,094 | 5,104 | 2,105 | 81,093 | 52,533 | 27,499 |
| | 31/10/49 | 2,117.7* | 430 | 174,364 | 26,333 | 206 | — | 69,838 | 1,112 | 79,099 | 6,197 | 4,870 | 80,426 | 45,081 | 21,999 |
| Pengkalen ... | 30/9/48 | 1,776.9 | 396 | 145,901 | 21,215 | 604 | 364 | 59,897 | 4,623 | 68,444 | 4,292 | 2,880 | 69,856 | 33,540 | 21,450 |
| | 30/9/49 | 1,993.5 | 408 | 168,257 | 25,008 | 879 | 3,384 | 67,075 | 5,824 | 77,735 | 6,348 | 6,824 | 77,259 | 42,819 | 23,650 |
| Kent (F.M.S.)... | 31/12/48 | 1,581.1 | 368 | 145,906 | 21,776 | 625 | 6,219 | 70,701 | 1,068 | 47,653 | 1,146 | 2,940 | 45,859 | 18,843 | 11,550 |
| | 31/12/49 | 1,603.6 | 381 | 157,173 | 23,714 | 914 | 6,758 | 71,393 | 399 | 54,793 | 1,331 | 5,112 | 51,012 | 28,616 | 11,550 |
| Total Figures for the Group | Previous a/c | 7,972.1 | 2,191 | 838,862 | 125,244 | 3,097 | 10,252 | 290,853 | 21,877 | 431,293 | 35,049 | 19,804 | 446,538 | 241,777 | 130,963 |
| | Last a/c | 8,332.2 | 2,157 | 879,929 | 133,063 | 4,187 | 13,901 | 324,050 | 26,086 | 430,814 | 34,380 | 33,542 | 431,652 | 234,763 | 136,771 |

*includes 225,700 cu. yd. tailings in 1947/8 and 1,117,400 cu. yd. tailings in 1948/9.

# Tanjong Tin Dredging Ltd.

TANJONG TIN DREDGING owns leases covering approximately 638 acres of tin-bearing ground in the Mukim of Taja, Kinta District, Perak, Malaya. Soon after the resumption of dredging in June, 1947, Tanjong acquired the undertaking and assets of Sungei Luas Tin Dredging Ltd., including a large dredge with 15 cu. ft. buckets, for a consideration of 423,334 shares of 5s. each. Shareholders of Sungei Luas received these shares in the ratio of one Tanjong share for every three Sungei shares held.

The ground in the Tanjong area is expected to keep both dredges usefully employed for about ten years, and estimating the price to be received for concentrates over this period at the conservative figure of £250 per ton the probable gross annual mining profit from both dredges together has been estimated at £100,000. In 1950 the actual price obtained for concentrates was nearer £500 than £250, and early this year has been around £750.

The combined properties are estimated to contain about 105,000 cu. yd. with a recoverable tin-ore content of 24,000 tons, about 62 per cent of this being on the Tanjong property. The dredge acquired from Sungei Luas has been transferred to the Tanjong area, and since December, 1950, has been making its contribution to the company's output returns. Slow delivery of certain necessary equipment was responsible for the delay in getting the dredge into action.

It is hoped to re-equip the Sungei area, covering 503 acres, half of which remains undredged, with a large capacity dredge. The directors, however, consider that with the ground of low grade, and present dredge costs so high, it would be advisable to leave this project in abeyance.

Tin ore production for the 12 months to December 31, 1949, did not reach the level of the previous year. Dredging conditions were far from ideal, heavy clay persisting for the first eight months of the year, and there was a falling off in the value of the ground worked, which at 0.47 lb. per cu. yd. showed a decline of 0.21 lb. Conditions improved from August, however, when there was a slight alteration in the course of the dredge. The volume of ground treated increased during the year by more than 150,000 cu. yd. to a total of 1,153,000 cu. yd., the tin-ore yield being 240.78 tons compared with 302.42 tons in the previous year.

Gross revenue from sales of tin-ore amounted to £98,256, plus £372 from other sources. After charging royalties, smelters' charges, etc., of £15,551, and mining expenditure of £66,409, there was a mining profit of £16,667 against £38,333 in 1948. Provisions for other charges reduced the amount available for distribution which, with the £7,147 brought forward, amounted to £16,741 against £38,334. A provision of £2,007 was made for loss on realization of investments, plant written off, etc., and one of £10,000 to reserve fund. The accounts for 1949 made no provision for taxation (compared with £20,000 in 1948) and the carry forward amounted to £4,734 (£7,147).

Considering it necessary to strengthen the cash and financial position of the company, the Board decided they were unable to recommend a dividend distribution. In the previous year 5 per cent, less tax, was declared. That this setback was only temporary is shown by the declaration of an interim dividend of 20 per cent in respect of 1950. As stated by the chairman, Mr. R. C. Savory, in his address to shareholders last July, the improved conditions in the latter months of 1949 continued into this year.

Returns for the first quarter revealed a fairly normal 78 tons. A small increase occurred in the second quarter; but the third quarter's recovery was improved to the very high figure of 141¾ tons. A fourth quarter return of 134¾ tons, made up a grand total of 452½ tons. The output for the fourth quarter was awaited with great interest, following the company's announcement that its No. 2 dredge had commenced dredging trials on November 26, 1950, and that opening up operations were continuing satisfactorily. The rate of output was nearly doubled in December at 61 tons, while the prospects for 1951 are better still, January output being 104 tons, equivalent to an annual rate of 1,248 tons. There seems little doubt that the 1950 financial accounts reflecting both increased output and a higher tin price, will make pleasant reading for shareholders of the company. Moreover, it is noteworthy that the company has already declared a first interim dividend of 25 per cent in respect of the current year ending December 31, 1951. The mine output for the first quarter of the year is advised as 279 tons of tin ore.

The balance sheet as at December, 1949, revealed that the year's expenditure on the reconstruction of the No. 2 dredge amounted to £79,141, making a total expenditure on the dredge of £117,183. A further sum of £1,067 making a total of £79,768, was used for rehabilitation of the No. 1 dredge and property. The company has so far received advances from the Malayan Government of £155,560 to be set off against the company's claim for war damage compensation, which is in excess of the advances.

# Kinta Tin Mines Ltd.

KINTA TIN MINES LTD., was registered in 1900, and owns tin-bearing land situated near Gopeng, Malaya, covering an area of 1,079 acres on which hydraulic plant is installed. In association with Gopeng Consolidated, the company owns the adjoining Sanglop Rubber Estate with its 1,400 acres, of which approximately 800 acres are planted.

Dividend payments for the years 1935 to 1941 to holders of the capital of the company (which amounts to £120,000, divided into 5s. units), were regular and satisfactory. For this period the average distribution was 28¾ per cent, the largest payment being 47½ per cent for 1937. During the four years of the Japanese occupation of the properties, it was estimated that some 18 acres of tin land were worked, producing 887 tons of tin ore.

The rehabilitation period presented the company with many difficulties, the principal one being the obtaining of essential materials for reconditioning hydraulic installations. Nevertheless, re-equipping was completed to allow operations to be restarted in January of 1947. For that year, and the following one, tin ore outputs were 301 tons and 458 tons respectively, with net profits before taxation of £54,007 in 1947 and £121,720 in 1948. The dividend distribution for the first of these years was 15 per cent, followed by a payment of 45 per cent for 1948.

The results for the calendar year 1949, due to the lower value of the ground treated, disclosed a decline from the high earnings of previous years. Despite the treatment of 783,100 cu. yd., an increase of 23,500 yd., tin ore production fell by 150 tons to 308 tons. Revenue from sales of tin (after charging £19,831 for royalties, smelters' charges, etc.) amounted to £105,942 compared with £152,646, the average price received per ton of tin having risen by £11 to £346. Receipts from tributers and other sources added £8,421 (£11,989).

Mining expenditure at £38,706 showed a reduction of nearly £2,000 despite the increased volume of ground treated and costs were reduced from 45.39c. (Malayan) to 42.37c. per cu. yd. The mining profit of £75,657 was down by £48,405 when compared with the 1948 profit. After providing for administration charges, and amounts written off property, plant and investments, the company had a net profit, before taxation, of £71,534. The provision for taxation amounted to £37,000 (£66,000), and £20,000 (£25,000) was transferred to general reserve. Shareholders received a distribution of 40 per cent, which required £26,400, and the amount left to be carried forward amounted to £11,394 (£13,204).

Of the company's two sections, Lallang and Damak, the former, although again responsible for the major portion of the year's output, produced 123.80 tons less than in 1948, having treated 299,600 cu. yd., which yielded 200 tons of tin ore, compared with 352,300 cu. yd. and 323.80 tons respectively. The average yield per cu. yd. fell by 0.62 lb. to 1.43 lb. Cutting continued to the south-east in the second lift at the maximum depth, while a tributer used seepage water to extract pockets of ground in depth between limestone pinnacles in the north.

Since the end of 1949 ground available on the Lallang section in the lower lift has been exhausted and operations have been transferred to another site. The ground on the new site is of lower grade, but a good yardage is being treated, and output is expected to be maintained.

Although the Damak Section increased the volume of ground treated by nearly 80,000 yd. to 483,500 cu. yd., a fall of 0.18 lb. to 0.55 lb. in the average yield resulted in a fall of 17.30 tons in output to 116.66 tons. In this section the paddock was developed to the north and north-west in low grade ground and a considerable amount of limestone was encountered.

The company's Jubilee was celebrated last year, and appropriately enough the year was marked by much improved operating results. During the year, output rose sharply by 95 tons to 403 tons which, together with the higher price obtaining for the metal, will undoubtedly result in a sharp rise in profits. The financial results are not yet available, but shareholders have so far received three interims of 7½ per cent each, and one of 20 per cent. In addition, a Jubilee bonus of 10 per cent has been declared. These distributions compare with dividends of 10 per cent in each of the two previous years. More recently, a first interim dividend of 15 per cent has been declared in respect of the current year's working to December 31, 1951, the output of tin ore for the first three months of the year being reported as 84 tons.

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# Malaysiam Tin Ltd.

MALAYSIAM TIN, which was registered in February, 1929, owns tin-bearing properties in Malaya covering 1,331 acres at Tambun, near Ipoh, and a further selected area of 654 acres of alluvial tin-bearing land known as Glami, situated near Seremban, Malaya. Post-war operations were resumed in April, 1946, and the company have two gravel pumps in action. The Glami area, which was being worked by tributers, ceased operations in July owing to the bad security conditions. At the Kluang Valley, however, tributers were able to make satisfactory progress. The company also owns a rubber estate at Tambun, where some 47 acres are under rubber. Of this total 28 acres are planted with budded rubber.

## POST-WAR RECORD

For the first three post-war years the trend of tin recovery was disappointing. In the first year to March, 1947, 442,000 cu. yd. were treated for a recovery of 121 tons of tin ore. The following year, despite an increase of more than 50,000 yd. treated, there was a decline to 95½ tons. Output in 1949 was further reduced to 91¾ tons, but in that year the volume of ground treated fell by more than 150,000 cu. yd. These outputs compare with a yearly average of 250 tons for the seven years prior to the invasion of Malaya, and tell the sorry tale of the Japanese occupation.

In the year to March, 1950, however, the company's tin recovery improved somewhat to 106¾ tons. Of the two working sections, the larger contribution was made by the Rambun Section, which, from a treatment of 295,800 cu. yd., recovered 80 tons of tin ore. The ground treated in this section in the first nine months of the year was of poor value, but a turn to working ground in the West, where better values were obtained, brought the average yield up to 0.60 lb. per cu. yd. as compared with 0.48 lb.

In the Sungei Choh section 207,200 cu. yd. were treated for a recovery of only 26¾ tons of tin ore. Here the ground treated contained a large proportion of slime and tailings from former workings. Operations in the initial paddock ceased in March, 1950, and development of a new paddock commenced.

The financial results for the year to March, 1950, showed that although output increased by only 15 tons, net revenue from sales of tin improved, due to the rising price of tin, to £36,878 compared with £29,747 in the previous year. Revenue from tribute workings of £5,302, and other sources of £676, brought the total mining revenue to £42,857 (£36,920). The accounts disclosed a marked improvement in working costs, which, despite the very much higher volume of ground treated, were only a little more than £100 up at £30,701, the average cost per cu. yd. thus being reduced from 20.74d. to 14.65d. As a result, mining profit was almost doubled at £12,039. The Tambun Rubber Estate produced a profit of £742 (compared with a loss of £345 in 1949), which, with other receipts, made up a total of £13,616 (£5,986). After charging administration expenses, depreciation, etc., there was left a sum of £15,504 (including £6,085 brought forward) available for distribution. The taxation requirement was £5,179, and with a provision of £3,000 for transfer to general reserve, the amount remaining to be carried forward was increased to £7,325. In view of the impending development expenditure, to which reference is made below, it was again decided to defer the payment of any dividend, at least for another year.

## EXPLORATION

During the year to March 31, the Tambun Area was exhausted and with future prospects of the company depending largely on finding a suitable replacement area, much exploratory work has been carried out. Intensive work on the Sungei Choh Section proved disappointing, and the company is now developing an area known as Tanjong Area, where two pumps are at present in operation. Although bores have disclosed values sufficiently high to justify further prospecting, the presence of much stone and boulders makes bore valuations unreliable. To obtain a true picture of the economic possibilities of the area, actual working will be necessary.

In consequence of the exhaustion of the Tambun Area, tin ore output during the first nine months of the current year shows a substantial reduction at 40¾ tons as compared with 80½ tons for the corresponding period in the previous year. Some compensation, however, will be obtained from the much higher price of the metal, which should average something like £800 per ton. There may also be a reduction in mining expenditure, but it seems probable that the financial results for the year to March, 1951, will show a fall in profits. The company's claim for war damage compensation, which amounts to £67,000, has still to be considered in detail, but information has been received that it is the intention to make at least a partial settlement at an early date.

# Petaling Tin Ltd.

INCORPORATED in the Federated Malay States in 1920, Petaling Tin owns mining leases and sub-leases over about 2,700 acres near Kuala Lumpur, Selangor, Malaya. An approximate idea of the size and profitability of the Company's operations in the pre-war period can be gathered from some of the salient returns for 1940, the last year for which its accounts were published before the Japanese occupation of Malaya. In that record year 3,640 tons of tin ore were recovered from 8,826,300 cu. yd. of ground treated, giving net earnings (after contributing £44,367 to War and Patriotic Funds) of 153 per cent on an issued capital of £256,667 and allowing a distribution of 125 per cent to be made. In the post-war period 43 tons were recovered in 1946 from some 92,000 cu. yd. treated, but dredging operations on any scale were held up until the last four months of 1947 when with two of the four dredges (Nos. 3 and 5) in operation, 673 tons were recovered. In the year to October 31, 1948, this figure was more than doubled at 1,575 tons, and in 1949 was further improved to 2,210 tons.

The year ended October 31, 1950, is the first post-war year in which more than two dredges have been in operation, the long awaited high capacity No. 6 dredge having come into production n March, 1950, though No. 4 remained on care and maintenance.

During the year the volume of ground treated by these three dredges showed a considerable increase over the previous year, the relevant figures being 7,976,400 c. yd. yielding 1,874 tons against 6,321,850 cu. yd. yielding 2,209 tons. This decline in output was due to the lower grade of ground through which No. 3 dredge had to work. In spite of a rise in the price received per ton of approximately £68 to £405 12s. 5d., most of this advantage was absorbed by higher production costs which increased by nearly £50 to £126 4s. 10d. The result was that revenue amounted to £553,584 against £592,544 and net profit worked out at £376,535 compared with £436,516 previously. From the £509,547 available, interim dividends aggregating 60 per cent were paid absorbing £123,200, and £175,000 went to general reserve, leaving a balance of £211,347.

Since the close of the Company's year, however, issued capital has been doubled to £513,333 by the payment of a 100 per cent capital bonus, and a final dividend of 25 per cent, less tax, on the increased capital has absorbed £89,833, leaving a balance of £121,514 to be carried forward compared with £133,489 previously.

Rehabilitation has been a long and expensive task particularly in respect of the No. 6 dredge, owing to damage when the hull was sunk in the Japanese invasion and to delays in plant delivery.

The activities of Communist terrorists have caused conditions to be very unsettled during the past three years, though no incidents have occurred on the Company's property. Towards the end of 1949 check boring was commenced in the northern part of the property, where previous boring had indicated values below the ground already dredged. Initial results were promising, and during the past year 178 further bores were put down to prove the extent of the re-treatable ground. It was decided that the area should be worked by opencast gravel pump methods and delivery of plant is expected shortly.

The Company has exercised an option over 538 acres of the property of Seaport (Selangor) Rubber Estate, situated only five miles from the Puchong area, after prospecting carried out by Messrs. Osborne & Chappel, the General Managers. Although the overall estimated recoverable value of the selected area is not high, the ground is very suitable for treatment by the No. 5 dredge and it will, as Mr. J. T. Chappel, Chairman, said at the annual meeting held in Ipoh on February 28 last, provide a profitable additional life for this unit of approximately eight years, provided the price of tin does not fall below £600 per ton.

Application to the Government for the area's conversion to mining title has already been made by the rubber Company, and if it is approved the Company proposes to transfer the No. 5 dredge from the Puchong section to this new area. This will involve the dismantling and re-erection of this unit, which will take approximately one year, and it is hoped that dredging will begin at the Seaport Estate in the first half of 1953 if there is no undue delay in the delivery of the material required. The terms agreed upon for working the area provide that tribute will be payable to the Estate at the rate of 10 per cent of the net value of the ore won, subject to a minimum tribute of $2,000 per acre worked.

For the current year the outlook is favourable, but until an unrestricted supply of power becomes available, little improvement can be expected in the No. 6 dredge's running time, which has been curtailed to less than 17½ hours a day, owing to the Central Electricity Board's inability to meet all consumer demands. Notwithstanding this contingency, two quarterly dividends totalling 60 per cent, less tax, on account of the year ending October 31, 1951, have so far been declared, indicating the high level of earnings the Company is currently enjoying.

# Kinta Kellas Tin Dredging Co. Ltd.

KINTA KELLAS TIN DREDGING CO. was registered in 1926 to prospect for, and work, tin areas in Malaya and has one dredge in operation. The company has an agreement with the Kinta Kellas Rubber Estates Ltd. to prospect its land for tin and to work the suitable areas in consideration of a royalty of 6 per cent of the value of tin recovered. The Rubber Estates, situated in Perak and Negri Sembilan, total approximately 6,558 acres, of which 768 acres have been proved, containing some 60,000,000 cu. yd. with an average yield of 0.60 lb. of tin ore per cu. yd. Only a little more than one-quarter has so far been worked. Agreement has been reached with the rubber company whereby certain areas, not suitable for working by the company's own dredge, will be worked by tributers.

In addition, the company also owns 370 acres of tin bearing land in its own right.

### BEFORE AND AFTER THE OCCUPATION

The property was evacuated in 1941, when it was occupied by the Japanese, and it was not until August, 1947, that dredging operations were resumed by the company. In the fourteen years prior to the evacuation of the property the company recovered an aggregate of 4,290 tons of tin ore, or a yearly average of 306.44 tons. Following the resumption of dredging in August, 1947, operations to March, 1948, recovered 237 tons of tin ore, when the average price received per ton of ore amounted to £346 and the cost per ton to £183. The dividend distribution to shareholders for 1948 was 20 per cent.

Considerable improvement was shown in 1949, with tin ore recovery up 112 tons at 349 tons, and the average price received up to £341 per ton of ore. Cost per ton, however, also rose by £51 to £211. The dividend was again 20 per cent. It is indicative of the rapid rise in costs that while the realized price of tin per ton in 1949 was up by 127 per cent compared with the price in 1940, costs per ton had soared by no less than 441 per cent in those nine years.

Dredging operations in the year to March 31, 1950, continued satisfactorily for the first half of the year, with stoppages only for routine maintenance. During the second half of the year, however, the ground deteriorated, and the tonnage of tin ore won was considerably down. On the whole year, the volume of ground treated at 1,610,649 cu. yd. rose by more than 80,000 cu. yd., and the tin ore yield was 4 tons higher at 353 tons, the yield per cu. yd. being almost unchanged at 0.49 lb.

There was a slight improvement in the costs per ton at £200, a fall of £11, whilst the realized price was £9 higher at £350 per ton. Revenue from sales of tin ore were £123,552 compared with £119,276 in the previous year. Sundry receipts brought the total revenue to £125,531 (£120,981). After charging mining expenditure of £70,797 (£73,847); royalties, £7,413 (£7,157); depreciation, £4,107 (£4,127); and administration expenses, £3,374 (£3,167), there was a profit, subject to taxation, of £39,837 against £32,683. The unappropriated profit in 1949 of £12,829 was reduced by £4,000, this being required for Malayan taxation liability for the year 1947/48.

The balance of £8,829, plus the profit, made a sum of £48,666 available for distribution. The 1949/50 taxation provision was £28,631 (£21,566); and £167 (£3,540) was written off rehabilitation account. The distribution to shareholders was again 20 per cent, requiring £11,550, and the balance remaining to be carried forward amounted to £8,318.

### MR. BURGESS FORECASTS SATISFACTORY YEAR

In his annual statement in September last year, Mr. P. J. Burgess, chairman, referred to severe taxation and the greatly increased cost of new equipment. These, he said, had meant the abandonment, for the time being, of any idea of building a second dredge or extensive alterations to the present one. The condition of this dredge is first-class, and there are ample spares. Ore reserves are large and reasonably well spread. For the present, operations are continuing in ground of low values, but the chairman anticipated that "the return for the year 1950/51 will prove quite satisfactory, and if, at the moment, the tin output is somewhat low, the price of tin is high." Tin ore production in the year to March 31, 1951, was not up to the previous year's total. At 223 tons the reduction was 98 tons, but with the considerably higher price obtaining for the metal, the financial results should at least be equal to those of the previous year.

# South Bukeru Areas Ltd.

SOUTH BUKERU AREAS LTD. was incorporated on August 29, 1929 to acquire the undertaking and assets of South Bukeru (Nigeria) Tin Co., Ltd., which included the titles to Alluvial Tin properties situated in the Bukuru district of the Bauchi Plateau, Northern Nigeria.

The Vendor Co. was incorporated on October 25, 1910, from which date mining operations on its properties had been in progress resulting in an aggregate production of some 2,000 tons of tin ore.

Whilst this production represented the mining of the known richest and more easily worked ground, the extent of such mining and consequently of the tin ore reserves which remained on the properties at the date of acquisition was obscure, owing in particular to the working of the properties under European tribute which had applied to various periods of past operations.

In the latter connection the remaining tin ore reserves were initially estimated at some 700 tons, but check prospecting of the sections covered by this estimate did not confirm such tonnage, and re-prospecting of the whole of the areas was carried out over the period 1933/1936. As one result of this work certain sections were estimated to contain some 300 tons of reserves, but the over-riding result was to evidence the generally patchy nature of most of the ground. This patchiness at once indicated the extensive nature of mining operations in earlier years, but at the same time pointed to the possibility that considerable small scattered deposits had for one reason or another remained unworked, and emphasized that, in the latter event, the course of future productions and of future financial results would depend primarily upon the successful location and demarcation of these deposits and upon their subsequent economic working.

The course of subsequent mining operations to date has confirmed the foregoing deductions, as whilst the annual estimates of proved tin ore reserves have for a considerable period remained at around 100 tons, total production of tin ore since the above mentioned prospecting, and to December 31, 1949, has aggregated 1,252 tons. Tin ore production from the inception of the company to the latter date accordingly aggregated 1,832 tons, and 62¾ tons were produced in 1950. Over recent years a small production of columbite has also been obtained.

At December 31, 1949 the company's properties comprised Mining Leases over 2,406 acres, six Water Rights and one Certificate of Occupancy, and in addition an Exclusive Prospecting Licence of 0.08 sq. miles was under application.

Whilst the first two financial periods of the company were characterized by depressed tin prices, the small profits were nevertheless incommensurate with the tin ore produced, and following the reconstitution of the Board in 1932 new working arrangements were instituted, and the company entered the dividend stage in 1933. From that date annual distributions have been maintained, the total distributions over the period 1933/1949 being equivalent to an average of approximately 9¼ per cent. An interim dividend for 1950 of 3 per cent was paid on September 5, 1950.

In successive past annual reviews, the chairman has drawn attention to the extensive period of past operations on the company's mining leases, and to the fact that future production results are dependent upon analogous future success in locating further unworked deposits. In the latter connection, the chairman reported in his review for the year ended December 31, 1949 that as the result of prospecting during the year, 81 tons were added to the estimate of proved tin ore reserves, but that this tonnage was contained in numerous small deposits of a few tons each, which accorded with the nature both of the deposits proved in earlier years, and of the deposits represented by the proved tin ore reserves at December 31, 1949, which were estimated at 144 tons. He also reported that the general manager had confirmed his previously expressed views that further sections of unworked ground were likely to be located by future prospecting. In the same review the chairman also reported that the company's future tin ore production would be sold under contract on the basis of market prices, and referred to the continuing uncertainty and concern which applied to the general question of costs.

The issued Share Capital of the company at December 31, 1949 was £25,001 in 2s. shares, and Capital and Revenue Reserves (including a credit balance to Profit and Loss Account of £1,998) totalled £19,059. Currents assets at the same date, amounted to £18,516 and Quoted Investments at cost totalled £25,789 and current and other liabilities aggregated £13,653.

# Naraguta Extended Areas Ltd.

NARAGUTA EXTENDED AREAS LTD. was incorporated on August 26, 1929 to acquire the Titles to the alluvial tin properties and the other assets of Naraguta Extended (Nigeria) Tin Mines Ltd., situated along the Delimi River Valley on the Bauchi Plateau of Northern Nigeria.

The company's predecessor was incorporated on December 8, 1911, and mining operations, which in the latter years were carried out under a European tribute, had resulted in an aggregate production of some 4,000 tons of tin ore. This production reflected the working of a considerable proportion of the known richest and more easily mined sections of the areas, but in his report to Naraguta Extended Areas Ltd. covering the operations for the year ended December 31, 1930, the Tributor estimated the remaining tin ore reserves at 2,500 tons.

The subsisting tribute arrangement was terminated in 1932, and operations placed under salaried management, and extensive re-prospecting was subsequently carried out over the years 1933/35. On the basis of this work the proved reserves on the sections prospected were estimated at December 31, 1935 at 1,900 tons, though this tonnage was later reduced in the light of subsequent check prospecting of certain of the sections covered by the estimate. Prospecting with the object of determining the value of the remaining unproved sections was virtually suspended over the period of the late war, and at December 31, 1945 the proved reserves were estimated at only 191 tons. Prospecting was, however, resumed in 1946 and up to December 31, 1949 an additional 347 tons were added to reserves, the estimate of which at the latter date was 351 tons.

Tin ore production prior to the war amounted to 1,785 tons, and over the war period 1940/1945, 1,133 tons were produced. Production for the subsequent years 1946/1948 reflected the combined effects of the higher average production and the suspension of prospecting during the war period, and amounted to only 336 tons, but in 1949, 169 tons were produced. Production from the date of incorporation of the company to December 31, 1949 accordingly aggregated 3,423 tons. For 1950 the tin ore production was 136 tons.

Subsequent to incorporation, the company purchased additional areas contiguous to those originally acquired, and at December 31, 1949 its properties comprised Mining Leases over 4,232 acres, 12 Water Rights, 7 Certificates of Occupancy and 3 Exclusive Prospecting Licences over some 2 square miles.

The company entered the dividend stage in 1933 and annual distributions at varying rates have continued since that date, the total distributions to December 31, 1949 being the equivalent of an average over the period 1933/1949 of some 9 per cent. An interim dividend for 1950 of 3 per cent was paid on August 4, 1950.

In his review for the year ended December 31, 1949, the chairman in summarizing his earlier reviews as to the position of the company's areas recalled that whilst the small estimates of proved reserves over recent years reflected the extensive period of past operations, recent-past prospecting had given indications that further sections of unproved ground might eventually prove to be economically workable; and that an appreciable proportion of past annual productions had been obtained from ground outside the sections covered by the reserves as from time to time estimated. In these connections the chairman also stated that the General Manager in his report for the year had re-affirmed there was every indication that subsequent prospecting would locate further workable deposits, and had advised that the class of ground which is worked by native tributors, and which is outside the sections covered by present estimated reserves, or on which additional reserves may be located by future prospecting, is both extensive and unlikely to approach exhaustion for many years.

With regard to future prospects, the Chairman stated that these would be largely determined by the future course of costs and revenue and of developments arising from the prospective world supply and demand position of tin. So far as future revenue was concerned, he reported that the arrangements whereby all Nigerian tin ore was purchased by the Ministry of Supply terminated as from the opening of the Metal Exchange for dealings in tin on November 15, 1949 and that the company's future tin ore production would be sold under contract on the basis of market prices. The Chairman also stated that the same uncertainty as mentioned in his previous review, still applied to the general question of costs which continued to occasion anxious concern.

At December 31, 1949 the Issued Share Capital was £103,655 in 2s. shares and Capital and Revenue Reserves (including a credit balance of £2,107 to Profit and Loss Account) aggregated £30,289. At the same date Current Assets, less Current and Other Liabilities totalled £11,903 and Quoted Investments at Cost amounted to £34,334.

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# Kaduna Prospectors Ltd.

KADUNA PROSPECTORS LTD., which has been working tin producing areas in Nigeria since 1913, has in the past year reduced its number of mining leases by two, and as at December 31, 1949, had 24 leases covering a total area of 3,046 acres, and seven water rights totalling 20,315 yds. in length. The company also had a 76 per cent interest in East Africa Explorers Ltd. This subsidiary made a loss of £216 in the year to December 31, 1949, and as it was considered that profitable working was unlikely, its leases have been surrendered and the company has been wound up.

The production of tin concentrates since the war has shown little variation from year to year. In 1945 the properties were mined for a total of 65 tons, the lowest tonnage recovered for a considerable period. In the following year, however, output rose to 79 tons, and again in 1947 production was further increased by 19 tons to 98 tons. This higher rate, however, was not maintained in the three following years when operations produced 84½ tons, 84 tons and 84 tons respectively.

### INVESTIGATION OF NEW AREAS

Ore reserves as at December, 1949, were estimated at 270 tons, a reduction of 40 tons on the previous year. The company has hopes of the outcome of the examination of new areas, including part of the valley of the Niger River. The results of an aerial survey undertaken conjointly by Kaduna Prospectors Ltd., Kaduna Syndicate Ltd., and Maroc Ltd., proved sufficiently encouraging to warrant further prospecting by drilling. A preliminary examination of the most promising areas has been made. On the results of these examinations, not yet available, will rest the decision as to whether or not to develop these areas.

The financial results for 1949 were fairly satisfactory, despite the burden of increased costs. Revenue from sales of tin ore, which amounted to £34,170, was nearly £5,000 higher than in 1948. With receipts from other sources showing an increase of £213 at £560, there was a total income of £34,730 compared with £30,155 in the previous year. Following a 10 per cent increase in basic wage rates and a reduction in hours from 48 to 44 per week, the increased cost of African labour during the year was largely responsible for a rise of £24 19s. 4d. to £210 15s. 2d. in the average cost per ton of concentrates delivered on rail. Actual mining charges at £22,148 was nearly £3,000 up on the 1948 figure. After allowing for sundry charges amounting to approximately £4,000; allowance for expenditure on prospecting of £321 against £68; and a £1,050 increase in taxation at £5,400, there remained a net profit of £4,397 against £3,550 in 1948. The year's distribution to shareholders was an interim of 8¾ per cent and a final of 13 8/9ths per cent, making a total of 22 2/9ths per cent, less tax, the same distribution as for each of the previous four years. After providing £1,845 as written off property, plant and equipment in Nigeria, the balance carried forward amounted to £3,424 (£2,983).

Commenting on the subject of the startling fluctuations in the price of tin since the beginning of the Korean hostilities in June, 1950, the chairman, Sir Godfrey Fell, says in his annual statement of last year that it "cannot be regarded as a healthy state."

The balance sheet reveals a fairly strong position. Current assets are shown as £46,981, an increase of £2,836. Of this total £19,666 is in cash, and a further £17,500 invested in British Government securities, with a market value of £17,744. After allowing for current liabilities amounting to £9,705, there are net liquid assets of £35,276.

### CAPITALIZATION OF RESERVES

Output of tin concentrates during the year to December 31, 1950, was again 84 tons. Accounts for that year have not yet been published, but in March, 1951, £12,000 of the General Reserve was capitalized and a bonus issue made of two shares of 3s. each credited as fully paid for every three shares held. Subsequently an interim dividend of 33⅓ per cent less income tax, was declared, accompanied by an intimation that it was not anticipated that any further distribution would be made in respect of that year.

# Kaduna Syndicate Ltd.

KADUNA SYNDICATE LTD. was registered in 1910 to operate an alluvial tin-mining property in Nigeria. At the close of 1945 the properties owned by the company consisted of 53 mining leases covering an area of 9,881 acres; eight water rights totalling 82,785 yd. in length; and two exclusive prospecting licences over 2.8 square miles.

Production of tin concentrates during the war years was maintained at a consistent level, averaging 543 tons for the years 1940 to 1944 inclusive. Output in 1945 fell below this average by 98 tons, but there was an improvement in the following year to 550 tons. Subsequently, the trend has been to lower levels, with 456 tons in 1947; 418 tons in 1948; 368 tons in 1949; and 317 tons for the year to December 31, 1950. Despite the lower outputs, the net profits have been sufficient to enable the company to distribute to shareholders a payment of 75 per cent, less tax, for each of the fours years 1946 to 1949.

### BONUS ISSUE

In March, 1951, £48,000 of the General Reserve was capitalized by the issue of one share credited as fully paid for each share held.

An interim dividend of 50 per cent, less tax, was subsequently declared for the year to December 31, 1950, accompanied by an intimation that it was not anticipated that there would be any further distribution for that year. Accounts for the year to December 31, 1950, have not yet been published.

As a result of the lower output, revenue from sales of tin in 1949 at £140,204 fell by £16,488 compared with the previous year. It should, however, be remembered that the accounts for that year include only some six weeks during which the higher prices which followed the reopening of the London Metal Exchange were operative. In actual fact the company received an average price of £412 per ton on its sales as against the end-year ruling price of £600 a ton.

Other receipts, from investments, etc., increased by nearly £1,300 to £2,571, and the total income was reduced to £142,775 as compared with £157,975 in the previous twelve months. Mining charges were again higher at £83,292 against £79,406. Included in these figures are provisions for depreciation of £1,667 and £1,589 respectively. After taking into account sundry other charges, including taxation of £30,000 (£34,500) there remained a net profit of £22,912 compared with £27,359 in the previous year. Bringing into account £13,242 brought forward, and £832 previous provisions no longer required, the amount available for distribution totalled £36,986. The directors again decided to write off £246 (£975) to premium on British Government securities, and £3,000 was transferred to general reserve. The dividend distribution of 75 per cent, less tax, required £19,800, and the amount carried to unappropriated profits was slightly higher at £13,940. There was no provision in the 1949 accounts for staff superannuation and additional depreciation. In 1948 there were provisions of £5,000 and £4,126 respectively.

### STRONG BALANCE SHEET POSITION

The balance sheet position is strong, with cash standing at £91,334; tax reserve certificates valued at £24,225; and the British Government stocks investment of £64,500 having a market value of £65,508. Against the issued capital of £48,000 divided into 2s. shares, there are net liquid assets of £135,028.

The estimated ore reserves as at December, 1949, were practically unchanged at 1,429 tons.

# The Jantar Nigeria Co.

THE Jantar Nigeria Co. was registered in 1912 and from that year until 1935 was primarily concerned with the mining of tin. In 1935, however, the company added another string to its bow by exploiting its columbite deposits which have since become a useful additional source of revenue. To-day Jantar is not only one of the more important Nigerian tin producers but also one of the foremost world producers of columbite.

### AN IMPORTANT COLUMBITE PRODUCER

Some idea of the company's importance as a producer of columbite may be gathered from the results for the year ended September 30, 1950, when its output reached 226 tons, which forms an appreciable percentage of world production for 1950, totalling about 1,000 tons. An interesting feature is that whereas the metal is usually obtained as a by-product of tin mining, this company has amongst its 9,406 acres areas which are worked primarily for columbite. For the past few years the company has contracted for its entire output to be sold to the United States, and for the calendar year 1951 Jantar is to receive £832 per ton for 65 per cent columbium/tantalum pentoxide c.i.f. New York City, which compares with an average price of £406 per ton received for the calendar year 1950.

While the combined output of tin and columbite concentrates for the year ended September 30, 1950, at 443 tons (made up of 217 tons tin and 226 tons columbite) was only 7 tons less than the total for the previous year, the output of tin again declined. The explanation for the decreasing tin production, given by the chairman, Mr. C. A. P. Tarbutt, in his statement accompanying this year's report and accounts, is that there is a tendency to enter ground of lower value as work proceeds on the ore reserves blocked out. On the other hand, prospecting carried out during the year, chiefly on Kuru 1 property, resulted in the year's output of tin being replaced, with the exception of two tons. In the same property drilling has proved the existence of some 2,000 tons of good grade tin underlying a hard rock formation known as the Basalt lead at depths varying between 75 and 150 ft. Drilling is continuing satisfactorily on the lead and it is hoped that the difficulties of mining the tin from under the basalt can be overcome and mining operations started. In this connection, however, Mr. Tarbutt warned shareholders that considerable expenditure on new plant would be necessary.

It is this explanation by the chairman that gives meaning in the report and accounts for the year ending September 30, 1950, to the transferrence of £10,000 to a specially created general reserve to meet these commitments, and the appearance in the balance sheet under Fixed Assets of the two items: survey equipment £650, and Sub-Basalt Development Suspense £1,064.

The profit and loss account reflected the higher prices received for both tin and columbite and gross revenue amounted to £173,430, an increase of £47,901 over the previous year. Net profit showed a similar satisfactory contrast at £23,970 against £10,966. From the £33,301 (£13,961) available, the dividend payment was stepped up from 15 to 20 per cent absorbing a net amount of £14,850, gratuities were paid to retiring Nigerian staff amounting to £3,500 and the sum of £10,000 for the purpose mentioned above was transferred to general reserve leaving the carry forward higher at £4,951 compared with £2,824 previously.

The reserves of tin and columbite at the company's fiscal year-end were 908 tons tin and 1,983 tons columbite against 910 tons and 2,209 tons respectively, equivalent to over four years' supply in the case of tin and over nine years' in the case of columbite at current rates of production.

### CONSISTENT DIVIDEND PAYER

Jantar's dividend record is a good one. Although it did not escape the ill-effects of the depression this was the only lean period for investors, and since the payment of 5 per cent, tax free, in 1933 on its £135,000 issued capital, dividend distributions have been made every year.

The current year's results should make interesting reading. The price of tin, since the company's fiscal year-end on September 30 last has averaged over £1,000 a ton, in addition to which it will have the benefit of £832 a ton for nine months of this year for its columbite production, or more than double the price received during the year 1949-50. Output of tin and columbite for the first six months of the current year ended March 31, 1951, amounted to 122 tons and 116 tons respectively which compares with 105 tons tin and 118 tons columbite for the corresponding period last year.

# Beralt Tin & Wolfram Ltd.

SOME of the most important wolfram producing mines in the world are those owned and operated by the British company, Beralt Tin and Wolfram, situated at Panasqueira, near Silvares, near the Spanish border in the province of Beira Baixa, Portugal.

Since the Korean war the price of wolfram has been rising steadily, reflecting both the demand for tungsten for rearmament and the shortage of the metal now that supplies from China and Korea have dried up. The Beralt mines which produced over 200 tons of wolfram concentrates per annum before World War I and over 2,000 tons per annum during part of World War II are therefore once more assuming a position of special importance.

Yet for the year ending March 31, 1950, the company's operations were beset with difficulties. Drought conditions led to drastic curtailment of electric power and to the drying up of the Zezere river below the company's mill; devaluation and the resultant new sterling — escudo rate of exchange brought about an automatic increase of 25 per cent in working costs; and finally, in the same month the price of wolfram dropped to 75s. per unit, leading to a reduction in production from 148 tons in September to 89 tons in October, where it remained until the beginning of 1950.

The contraction in wolfram output from 1,890 tons in the year ended March 31, 1949, to 1,544 tons during the following financial year was paralleled by a decline in the average price per unit from 118s. 8d. to 96s. 10d. Tin production, however, was a bright feature and output reached 257 tons compared with 22 tons previously. Nevertheless, total sales of concentrates reflected the lower price and reduced output of wolfram so that revenue fell to £719,498 against £822,043. Expenses were higher and consequently net profit for the year dropped to a mere £11,414 against £175,641. To this net figure was added £49,879 brought in and the sum of £1,450 arising from a taxation provision no longer required making £62,743 available. A dividend of 20 per cent on the £331,000 issued capital absorbed a net amount of £36,410, taxation required £11,700 leaving the remainder, £14,633, to be carried forward.

The fact that the company was able to view with equanimity the reduction of the carry forward by £35,246 was indicative of the almost unbroken rises in the price of wolfram and tin since the end of the company's financial year. From April, 1950, to February, 1951, the average price per unit of wolfram moved consistently upwards from 97s. 6d. to 620s. and although it fell back to 532s. 6d. in March, the average price over the year ended March 31, 1951, worked out at about 294s. per unit. Similarly the average price of tin per ton rose progressively from £590 in April, 1950, to £1,445 in February, 1951, falling back to £1,326 in March, and giving an average price over the year of about £930 per ton.

It should be noted, however, that conditions arising out of the rapid price increase led the Portuguese authorities in February, 1951, to impose special export duties of Esc.36 per kilo of wolfram concentrates and Esc.15 per kilo of tin concentrates (equivalent to about £460 and £190 per ton respectively).

Although it is true that in 1932 the company produced more tin than wolfram, the winning of tin has always been of secondary importance. In the past it was mainly derived from the company's Corga Seca section, but the extension of the workings there laterally and in depth has given disappointing results, indicating that this area may be nearing exhaustion. Of the company's other tin bearing area, the Vale da Ermida, the position is quite different. The problem here is not the extent of the veins, which have already been exposed at depths up to 600 metres on their dip without any trace of fading out, but their payability at normal prices of tin. Large scale tests are now being carried out and Mr. F. Gates, the chairman, at the last annual meeting said that "if these tests reveal a payable average grade it will probably be necessary to put the old Panasqueira Mill, which is quite near to Vale da Ermida, into commission again to treat the ore." Most of the equipment required for this purpose is already available on the property.

The continued high prices for wolfram and tin have given the company an excellent opportunity of engaging in development and exploration work, as under present conditions such work will pay for itself. For similar reasons the company continues to work its wolfram from the scattered areas above main adit level. This is necessarily more costly but operations can be concentrated on the lower sections at substantial reductions in cost per ton of concentrates when the price of wolfram recedes from its present level.

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